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The Perfect Conductor

TO the electrical engineer the abrogation of Ohm's law, implicit in the idea of a conductor which offers no resistance to the flow of current and enables electricity to be transmitted as efficiently as light, is hard to accept at first. He is transferred from the safe world where effects may be traced logically to causes (though they may be a complex resultant of forces capable only of mathematical expression) into a nightmare realm in which known values cease to depend upon recognised relationships.

To find that at temperatures a few degrees above zero ohmic resistance suddenly ceases in an apparently arbitrary way is startling (although critical points at which departures are made from straight-line characteristics are familiar enough), but the continued flow of current in a conductor after the withdrawal of the e.m.f. which initiated it is another matter. It is true that certain conditions to which Ohm's law is inapplicable obtain to-day; thus the current in the discharge lamp (started with the assistance of cosmic rays) would build up to a disastrous value, bearing no definite relation to voltage or resistance, were it not held in check by the orthodox choking coil.

The question asked by members of the Institution of Electrical Engineers, one of the other, after the Kelvin Lecture, was: "Where is all this leading?" Professor J. C. M'Lennan made no prophecies. His purpose was not to evolve theories, but to report progress in his brilliant series of investigations into the behaviour of conductors at very low temperatures—behaviour which could not have been foretold mathematically, and the discovery of which represents a triumph for the experimental method. We may not within our time obtain 100 per cent. efficiency in power transmission, possibly on a constant-current system, but we do not discount the feasibility of applying the principle to the field of light-current engineering. The methods described are far too costly and elaborate for practical purposes, but it would be unwise to assume that they will always be so.

We know that the critical temperature of superconductivity can be raised under pressure, and that it differs for various metals. We also know that good current and heat conduction are to be found in the same substances, and conductivity is seemingly due to greater elasticity in the tie between electrons and their nuclei. If so, can we find the optimum elasticity? Is resistance a state rather than a physical attribute? Further inquiry along this channel might help towards an understanding of the nature of electricity. Again, why does a.c. in relation to its frequency require a lower temperature for superconductivity than d.c.?

Will further experiments, working from effect to cause, establish other relationships showing the way to the discovery and control of critical points? Are we heading towards an era in which the exploitation of critical conditions will become the normal method of achieving the highest engineering efficiencies? We hope that a continuation of the researches of Professor M'Lennan, particularly in magnetism (which has not yet received as much attention as the electrical aspect), will provide answers to these and many other questions.

Electrical Benevolence

LORD ASHFIELD, who has accepted the office of president of the Electrical Industries Benevolent Association, in succession to Lord Meston, was prevented by illness from being present at the annual meeting. We shall be voicing the general sentiment when we hope that he will have a speedy recovery. Lord Ashfield's recognition of the value of the work that the organisation is doing for those who, in the course of electrical pursuits of various kinds, are unexpectedly confronted by misfortune, was very clearly expressed in a letter which, in his absence, he had addressed to the retiring president. Though he is fully impressed by the progress made by the industry, he feels disappointed, as indeed we all do, that there has not been the same rate of increase in membership of the Association. The expansion of the industry (he takes the output of electricity as the basis of

comparison) does not lessen the need for benevolent activities; rather does it, and must it, increase the demands for relief as time goes on. He wants to see the invested funds increased for pension purposes, which after all has been a great objective that has been before the movement for many years—practically from its initiation. To-day there is a membership of only between 1,500 and 2,000, yet somewhere between 150,000 and 200,000 engaged in connection with the industry are eligible. Lord Ashfield appeals for an extension of the already useful efforts of Branch Centres into new districts. He intends to do his part as president to make the year 1934-35 a record one, and we hope that readers of these lines will follow his determination by resolving to do their own part to bring about that very desirable result.

Sutton of Henley's

ELECTRICAL men everywhere will receive with regret the news of the death of Sir George Sutton, Bt. He was an early pioneer of the British cable-making industry, and was one of the founders of the Cable-Makers' Association, whose work has made our cables renowned as high-class products in electrical markets all round the globe. Sutton's name was closely linked with that of Henley from the year 1881 right down to the last. Largely through his foresight, energy and spirit, the small, struggling concern which saved what was left from the late Mr. W. T. Henley's adversity, was piloted safely through troubled waters and patiently, enterprisingly and soundly developed. To-day it occupies a most commanding position. At twenty-four years of age he began his career as secretary of W. T. Henley's Telegraph Works Co., Ltd. At seventy-seven years of age we record his death while president of the same company. He had outlived practically all his contemporaries. Privileged by a long and more or less close association with Sir George, we feel qualified to say that the electrical industry is much the poorer by reason of his loss.

"Paper Engineers"

THERE appears to be a growing tendency to produce books, and particularly elementary books, which beat over the same ground in the same conventional way. The only reason for choosing one rather than another is that it may be regarded as better for the purposes of passing some examination. The veneer of knowledge that such books can communicate is thus steadily growing thinner. There is a risk that an understanding of fundamental principles of a subject may be sacrificed to a facility to perform a limited number of stereotyped calculations and to answer, without really understanding them, a few almost inevitable questions. An author who breaks away and essays an original treatment is not likely to meet with favour, as the object of the student is to pass an examination and of the publisher to supply him with books to do so. When in after-life the student comes up against the real problems of science and engineering he begins to realise that his education in fundamentals has been deficient. It was the fear of the results of superficial training obtained in this way that made the old-time "practical" man so suspicious of what he termed "theory" and persuaded him to go too far in the opposite direction.

Mr. Purse's Campaign

THE decision of the London and Home Counties Joint Electricity Authority to proceed with an intensive canvassing and development campaign is one of the most welcome events of recent months. As will be seen from the statement appearing on page 640 eight canvassers are to be engaged to secure new consumers and increase the consumption of present users in Twickenham, Surbiton, Esher and Sutton, and thus hasten the loading up of the mains that have been laid since the Authority took over various undertakings. In addition, two "special development assistants" will be appointed to establish relations with architects, builders and others interested in new building operations and secure their electrical co-operation. In the areas mentioned the existing staffs are so busily occupied connecting up new consumers on new estates and other construction that the electrical education of the public has, so far, had to look more or less after itself. It is obviously recognised that the rate of development can be speeded up when the staff organisation is strengthened in the two directions indicated. The appointments are described as "temporary," but we are convinced that, if generously conducted, the policy will soon justify itself, and involve other additions both to the canvassing and the mains and installation staffs. We hope that the example will be followed by many undertakings in different parts of the country, where much can be gained by closer electrical contact with the public. The larger the number of live agents we put to work, the sooner shall we have an electrically-minded community.

The New Lamp Specification

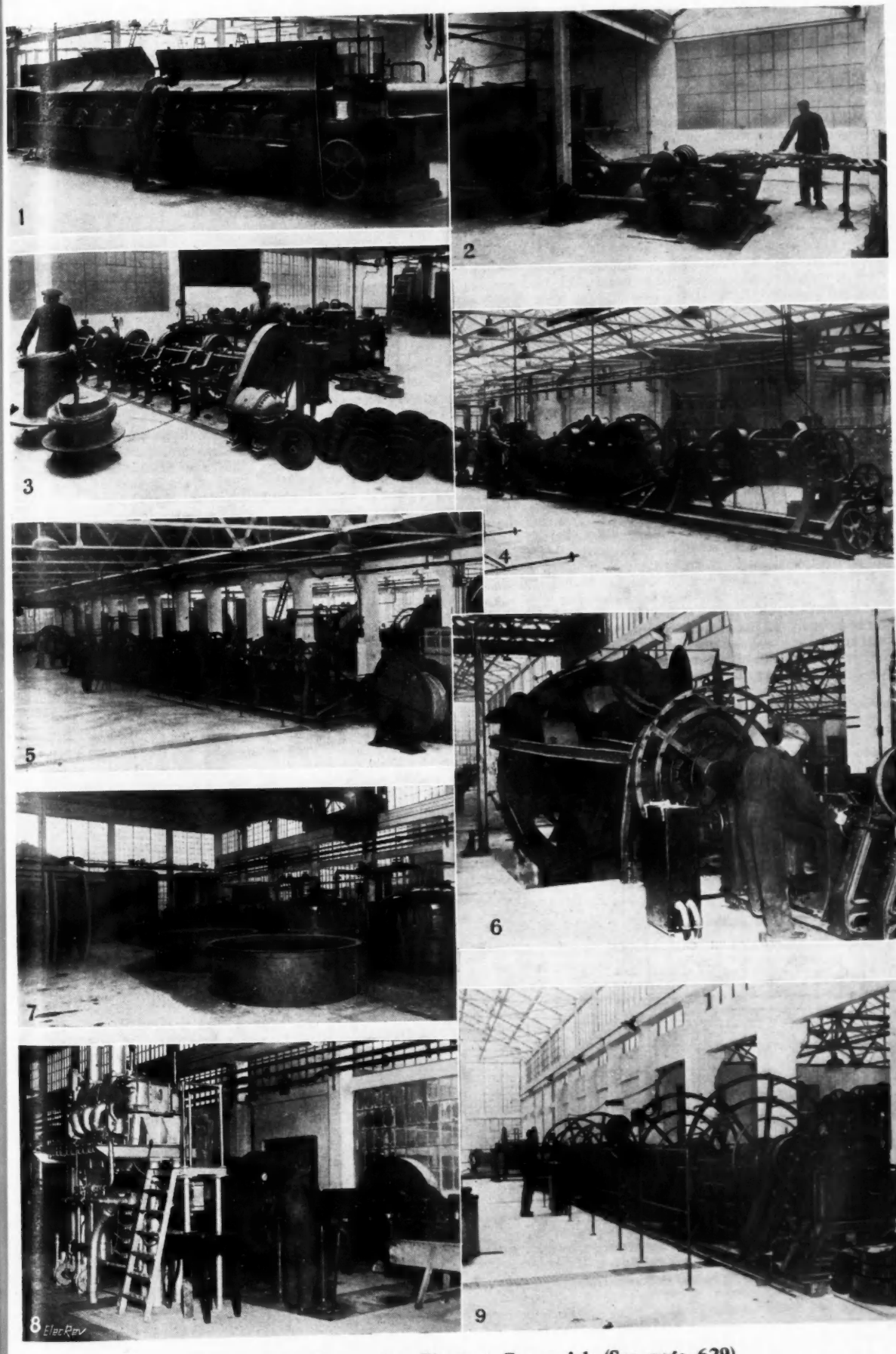
THE new British Standard Specification for electric lamps refers only to those of the ordinary type. What the user generally requires from a lamp is a long life and, at the same time, as high an efficiency as possible throughout that life, a good compromise between these two requirements being the criterion of excellence. The Specification enables lamps to be tested on these lines by prescribing minimum figures for (*a*) the life of the lamp and (*b*) its average efficiency throughout that life. Since such a test must, by its very nature, be a test of a small sample, statistical methods are used for interpreting the results obtained. In an article included in this issue Dr. J. W. T. Walsh considers the technical aspects of the modifications and indicates the many ways in which the new Specification differs from the one it supersedes. It can be used for judging the quality of lamps offered for sale on the open market, and provides for uniformity in a batch. Further, the life test is carried out at rated volts and the observed life is "corrected" to a life at a "standard efficiency," using a formula given in the Specification. We should expect the new requirements to be of greater practical significance, but to be more difficult to comply with than were the old.

Public Lighting Responsibility

NOT the least of the difficulties in securing a high general standard of public lighting is the lack of any recognised method among local authorities in apportioning responsibility for the service. The borough surveyor (as unbiased in favour of any competing method) often, but not always, officiates. He may (or may not) have an illuminating engineer as an assistant, or he may fall back upon the advice of the electricity or gas departments, which he is not bound to follow. Manufacturers of fittings and accessories complain to us of the time wasted in discovering anyone willing to shoulder the entire responsibility—technical points have to be discussed with one, prices with another, and general conditions with a third. Pending the clearing up of the present muddle, the Association of Public Lighting Engineers would do a very useful work in compiling a list of the people in every town who should be approached on the different aspects.

Precept and Practice

ONE of our readers has drawn our attention to a page in a South Wales newspaper in which an article on cooking and food is surrounded by advertisements. The most prominent of these relates to gas cooking; electric cooking is conspicuous by its absence. The article commences with a glowing commendation of a certain gas cooker, but the only illustration in the article shows the authoress operating an electric cooker! We wonder which of the two methods of cooking she really approves in her heart of hearts!



Power Cable Production Plant at Greenwich (See page 629)

1. Wire-drawing machine with the hoods raised. 2. An annealing furnace. 3. Wire-winding machines. 4. A 19-bobbin stranding machine. 5. Paper lapping. 6. A laying-up machine. 7. Impregnation plant. 8. A straight-through lead press. 9. An armouring machine.

Power-factor Improvement. By D. Dyson Rayner

A comparison of various methods

A GREAT deal has been published on the relative merits of the various methods of charging the consumer for the privilege of using alternating current, much to his confusion, while to add further to his bewilderment are the various methods by which the necessary improvement in power factor can be carried into effect.

The first method is preventive, and includes careful selection and application of induction motors with due regard to their loads, *e.g.*, the average induction motor operates between 50 and 75 per cent. of its normal rating, with a consequent poor average power-factor, and probably drawing a higher starting current than may be necessary. For new installations one can first ascertain the average load and employ a motor with a normal rating equal to this average, relying upon the inherent overload capacity of the motor to deal with occasional loads in excess of the average.

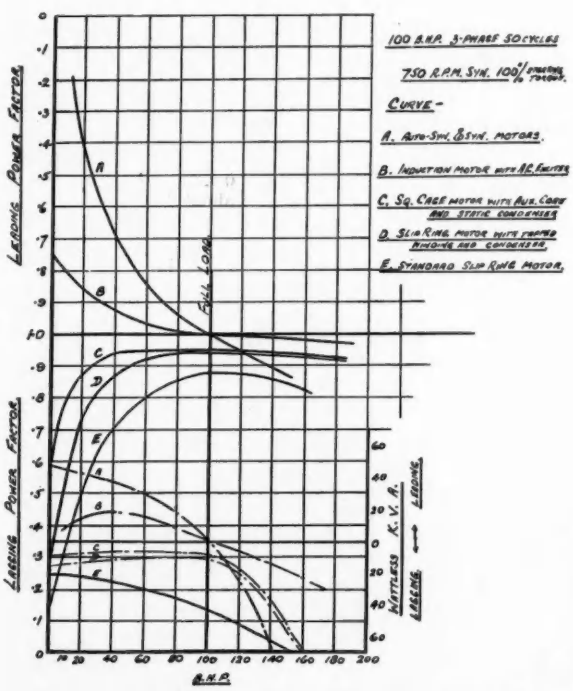
This will reduce capital expenditure, as a smaller motor and starting gear can be used, and the overall efficiency and power-factor will be considerably increased, thereby reducing the running charges. One should avoid using low-speed motors so far as the conditions will allow. The lower the speed the larger the number of poles required, with a consequently lower power-factor, and *vice versa*.

For existing installations the only preventive is rearrangement of the motors to comply with the above-mentioned conditions, retaining the surplus equipment for emergency service.

Artificial Correction Devices

The second method is compensative, and demands the use of artificial corrective devices, of which the following ten systems are available to the consumer, the correct choice depending entirely upon the local circumstances.

1. Synchronous motors can be used to advantage on many drives, and a large machine may be designed to give a large leading wattless component to compensate for the lagging wattless component of the rest of the system. They possess the further advantage of being suitable for direct coupling to the load at low speeds. They operate at constant synchronous speed. The starting needs complicated control gear and, unless over-excited, they are unable to take care of emergency overloads. The exciter must be automatically varied to compensate consistently for the changing requirements of the plant. They


100 B.H.P. 3-PHASE 50 CYCLES
750 R.P.M. SYN. 100% STARTING TORQUE.
CURVE -
A. AUTO-SYN. & SYN. MOTORS.
B. INDUCTION MOTOR WITH A.C. EXCITER
C. SQ. CAGE MOTOR WITH AUX. CAGE AND STATIC CONDENSER
D. SLIP RING MOTOR WITH PHASE ADVANCER AND CONDENSER
E. STANDARD SLIP RING MOTOR.
LEADING POWER FACTOR
LAGGING POWER FACTOR
FULL LOAD
WATTLESS K.V.A.
LEADING
LAGGING
B.H.P.

Power-factor characteristics of different types of motors

are liable to "hunt" and fall out of step, and must be carefully watched to avoid further complications due to an unnecessary high leading wattless compensation.

2. The auto-synchronous motor differs from the synchronous motor only in the method of winding the rotor to enable it to start as a slip-ring type induction motor. When up to speed it behaves exactly like a synchronous motor and suffers from the same disabilities, with the exception that in the event of an overload it will fall out of step and carry the load under induction motor conditions. The rotor is usually wound for a higher standstill voltage than a standard induction motor would be for the corresponding rating, say, up to 2,000/2,200 V, and the winding and switchgear must be insulated accordingly, otherwise the control gear is similar to that required for an induction motor with the addition of an exciter regulator and in some cases a change-over switch in the rotor circuit for inserting the exciter when the motor has run up to full speed.

3. A rotary convertor will behave like a synchronous motor, but as it can only be profitably employed when there is a necessity for supplying d.c. to a part of the plant, its scope is limited. As the voltage ratio of the convertor is fixed, it may be necessary to add a transformer, thereby increasing the capital cost of plant and switchgear.

Other Rotary Methods

4. Compensated motors are induction motors of special design in which the current is fed through the rotor slip-rings. They have, in addition, a separate winding on the rotor connected to a commutator, through which current at low frequency is led to the stator winding, which is now the secondary circuit. This type of motor is complicated, involving, in addition to the special winding, a commutator which is a function of the number of poles for which the motor is designed according to the speed required. They are limited to low-voltage systems owing to the difficulty of feeding high-voltage current through the slip rings, and furthermore the initial cost is high.

5. Phase advancers are relatively small machines which run in conjunction with a normal slip-ring-type induction motor, either directly coupled or driven separately by an independent motor. They consist of a d.c. motor-type armature with three brushes per pair of poles connected to the rotor circuit of the induction motor. The field systems of these exciters vary considerably, and as a rule are complicated by the fact that these machines are not self-excited; they must be excited through the intermediary of a frequency transformer. This comprises another unit fed through the main supply, which further necessitates transformers when the supply voltage is high. They have no commutating field and thus require a relatively large commutator.

6. Three-phase exciters are also relatively small machines which will run in conjunction with a normal slip-ring-type induction motor, and may be directly coupled to the main motor, or driven by a belt, or by an independent motor. They are very similar to ordinary d.c. exciters; both are self-excited, but, whereas the d.c. exciter supplies d.c. to the slip-rings of the induction motor, the a.c. exciter supplies a.c. of low frequency to the slip-rings. With a d.c. exciter the induction motor becomes a synchronous machine, but with an a.c. exciter it remains an induction motor possessing an increased overload capacity. The control gear is, however, rather more complicated than that required for an auto-synchronous motor, requiring in addition two further steps on the rheostat, the first of which reintroduces a step of resistance and cuts the rheostat out of circuit, while the second cuts this resistance out, finally bringing the excited into circuit.

7. Synchronous condensers suffer from the defect that their running costs are high, since they are usually synchronous motors running light, in which the energy for supplying the rotary movement, including the losses, is higher than the loss in static condensers.

Static Condensers

8. The static condenser is the simplest form of power factor compensator available. It has no moving parts and does not require any foundations; although not possessing the same degree of flexibility as those previously mentioned, it can be installed in the majority of cases to advantage. It can be applied to compensate for large blocks of lagging kVA, in which case the power factor correction, as in all the previous schemes, takes effect only up to the point of application. Under this condition care must be taken to guard against disturbances, as resonance due to the fifth and seventh harmonics may be increased considerably by the presence of a condenser.

9. On the other hand, the condenser may be applied to individual motors, thereby again only correcting the power factor up to the point of application, unless used in conjunction with a specially designed motor. In the latter case the scheme is not strictly applicable to existing installations, except by scrapping obsolete plant, but as it provides an efficient method of tackling the problem in an economical manner it is worthy of consideration. As the output for a given periodicity will vary approximately as the square of the voltage, the size of a condenser of given capacity will be approximately twice

as large for operation at 400 V as one designed for 600 V. 10. This fact can be turned to advantage by either providing the motor with a tapped primary winding arranged to act as an auto-transformer energising the condenser at 600 V while the main winding is operated at the normal supply, or providing the motor with an auxiliary core and compensating winding (see ELECTRICAL REVIEW, November 3rd, 1933) designed to energise the condenser at 600 V.

Both these types of motor have the advantage over the straight condenser application of correcting the power factor *inside* the motor and thereby improving its electrical performance in addition to correcting the external power factor, enabling a smaller motor frame to be employed for the corresponding output. Further, the motor with the auxiliary core and compensating winding corrects the power factor of the secondary member (usually the rotor) as well as the primary member, adding considerably to the overall performance. Also, as the latter type of motor is designed for self-starting without elaborate control gear, requiring only a circuit breaker, the installation is reduced to the simplest possible form combined with high operating efficiency and low maintenance charges.

Power factor correction is frequently said to permit the use of smaller cables. This is questionable, as (with the exception of the synchronous motor and rotary convertor) an important feature is the ability of the motor to operate as a straight induction motor in the event of a breakdown in the excitation system, under which conditions a normal value of lagging power factor would operate, necessitating cable with sufficient cross-section of copper to carry the increased current without exceeding the specified temperature rise or voltage drop.

Instrument Transformers. By A. Hobson, B.Sc.Tech.(Hons.)

Their applications for metering and protection

DURING the last few years instrument transformers have formed the subject of many articles and lectures, but most of these have been by persons connected with the manufacturing side or by experts who have devised new methods of testing. Very little, if any, information has been given which would be useful to purchasers for whom the following notes have been written.

The main uses of instrument transformers are two (1) for measuring various electrical quantities, and (2) for application to protective apparatus. In measurement, the primary requirement is accuracy and a method of applying to instruments the corrections due to the ratio and phase-angle errors. Ratio error is easily accounted for. If the secondary voltage of a voltage transformer is one per cent. higher than it ought to be, any instrument—voltmeter, wattmeter or watthour meter—operated by the transformer will read one per cent. high. This effect is entirely independent of power factor. Phase-angle error is of importance *only* where wattmeters, watthour meters, and, to a lesser degree, power-factor meters are concerned. Phase angles cause errors in the reading of wattmeters and watthour meters which depend on the power factor of the load being measured. The extent of these errors can be reasoned out as follows:—

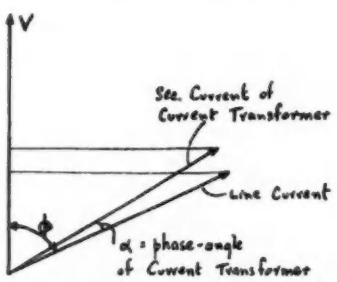
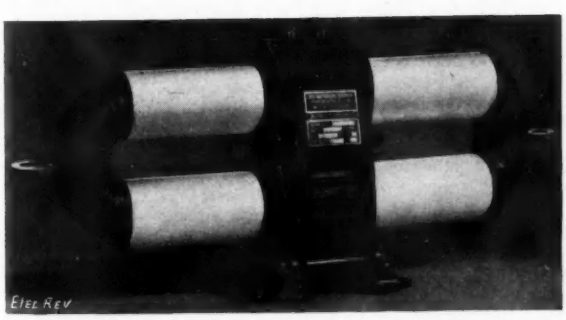


Fig. 1.—Effect of current transformer phase angle on wattmeter reading

The power in a circuit is given by the expression VI cos ϕ, where ϕ is the angle between the current and voltage vectors. If the current coil of a wattmeter is operated from the secondary of a current transformer, the phase-angle error of the latter alters the value of ϕ slightly. This is shown in fig. 1, where the transformer phase angle is assumed to be leading. As the wattmeter will read VI cos $(\phi-\alpha)$ instead of VI cos ϕ, the error due to phase angle is the difference between these two, *i.e.*, VI $[\cos(\phi-\alpha)-\cos\phi]$. The term cos $(\phi-\alpha)$ can easily be expanded to cos ϕ cos α+sin ϕ sin α. Since in practice α is very small, never more than about 3 deg., cos $\alpha=1$ and sin $\alpha=\alpha$ (in radians). Thus we have cos $(\phi-\alpha)=\cos\phi+\alpha\sin\phi$, and our expression for the error becomes VI $[\cos\phi+\alpha\sin\phi-\cos\phi]=$VI $(\alpha\sin\phi)$. Since VI cos ϕ is the true reading, the percentage error is $100\times$VI $\alpha\sin\phi$/VI cos ϕ or $100\,\alpha\tan\phi$.



Typical wound-type current transformers (Hackbridge) as used in Merz-Price protection

Now, if we put α=1 minute or .00029 radian, the expression becomes .029 tan ϕ. From this we can plot the useful curve shown in fig. 2, giving the percentage correction per minute of phase angle at various power factors. Using this curve the correction can be found instantly, the error per minute being read off for the power factor in question and multiplied by the phase angle in minutes to obtain the total error.

The curve closely follows the form of the rectangular hyperbola, and thus the error is very large at the low power factor, whilst it is zero at unity power factor. At 0.5 p.f. the error is .05 per cent. per minute, or 1 per cent. for 20 minutes of phase angle. This figure is extensively used in meter testing when allowance for instrument transformer errors is being made. Meters are usually adjusted to run correctly at unity and 0.5 power factor, and are then assumed to run accurately at intermediate values. At unity p.f. phase angle has no effect, and no allowance is made for it, but at 0.5 p.f. the above figure is used, *i.e.*, 1 per cent. for every 20 minutes.

It is at power factors below about 0.2 that phase angle becomes really serious, and where accurate power measurements are required at such low values the instrument transformers have to be very carefully chosen. As an example, in the testing of large power transformers the usual measurements made are those for ascertaining iron and copper loss. The power factor in both these tests is of the order of 0.1, in the first case due to the smallness of the loss current compared with the magnetising current and in the second to the high ratio of reactance to resistance

A striking instance is the Hackbridge 93,750-kVA transformers built for Barking power station. The power factor on the copper loss test was of the order of .04, and from fig. 2 it is seen that the error per minute of phase angle is 0.73 per cent. Supposing that the current-transformer phase angle was 20 minutes, the wattmeter error due to this would be nearly 15 per cent.—a matter of about 60 kW. The current transformers used had a phase angle of about 2 minutes. This is an extreme case, but it shows quite clearly the need for exceptionally accurate instrument transformers. Class A transformers are not nearly good enough, and transformers having phase angles of not more than 5 minutes should be used.

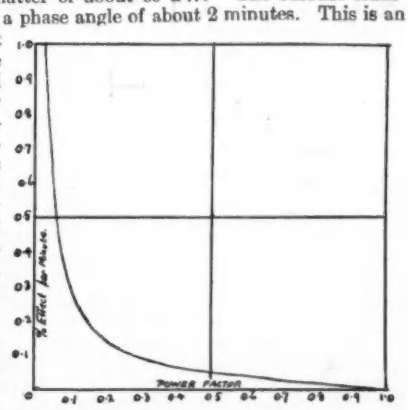


Fig. 2.—Relation between p.f. and error due to phase angle

Having found the errors caused by phase angles, it is a comparatively easy matter to apply the corrections for them. Again, the expression for power is VI cos ϕ. If the phase angle has the effect of reducing the angle ϕ, cos ϕ will be increased slightly, and the wattmeter will read high. The correction for phase angle should therefore be subtracted. Conversely, if the phase angle increases ϕ, the wattmeter reads low, and the correction should be added.

Thus, when measuring inductive loads, which are most commonly met with in practice, a leading phase angle on a current transformer causes a high wattmeter reading, whilst on a voltage transformer a leading phase angle causes the wattmeter to read low. Should the line load have a leading power-factor these effects will be reversed. There are some

"snags" in the application of these errors where the two-wattmeter method is being used to measure three-phase power, owing to the peculiar power-factors at which the individual wattmeters work; when instrument transformers are being used it becomes necessary to analyse the vectors and to find these power-factors. The appropriate correction for phase-angle error must then be ascertained for each wattmeter and applied to the individual readings before they are finally added together to find the total power.

The connections and vector diagram for the two-wattmeter method—assuming a balanced non-inductive load—are shown in fig. 3. Wattmeter 1 operates on the voltage AB and the current A, which lags by 30 deg., whilst the other wattmeter works on the voltage BC and the current C (reversed) which leads by 30 deg. If the circuit were working on an inductive power factor of cos ϕ, the current vectors A and C would have to be moved in an anti-clockwise direction by the angle ϕ. Thus, if ϕ is more than 60 deg. the current in wattmeter 1 will lag the voltage by more than 90 deg., giving a negative reading. To obtain this reading one of the coils has to be reversed, and thus this instrument is actually working on a leading power factor of something less than 0.5. The current on the other wattmeter, meanwhile, has swung from 30 deg. lead to somewhere between 30 and 60 deg. lag.

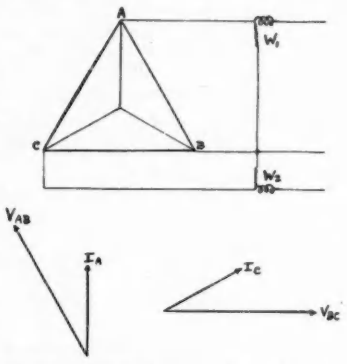


Fig. 3.—Connections and vectors for two-wattmeter method

Overload Protection

The requirements of instrument transformers for protective gear are entirely different from those of metering transformers. Ratio and phase-angle errors are of no consequence at all, but other characteristics become important. Overload protection, despite its inherent disadvantages, is still widely used because of its completeness (it protects against any kind of fault) and because of its simplicity of application. In its usual form it consists of a current transformer in series with the circuit to be protected, its secondary winding being connected to a relay or trip coil which is set to operate at a pre-determined value of load current.

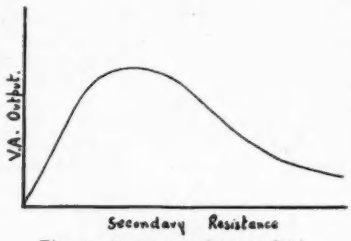


Fig. 4.—Output and secondary resistance

For securing a decisive action the relay is often shunted by a fuse which normally by-passes nearly all the current. When the line current reaches the desired—or rather undesired—value, the fuse blows and the whole of the secondary current is diverted to the trip coil, which immediately operates.

The current transformers used for overload protection do not embody any special features. As their ratio and phase-angle errors are unimportant they should not be used to operate instruments in addition to the trip coil; it is better practice to use separate current transformers. Since there is no need for accuracy, bar-type current transformers can be used for quite low values of line current, provided that they are capable of giving the full output required to operate the trip coil—which may be anything up to 100 VA. Failure to observe this condition has caused much trouble to switchgear manufacturers who have had to make costly alterations to their gear to allow space for more amply rated current transformers.

Limitation of Output

There is a definite maximum VA output that can be obtained from a given current transformer depending on the ampere turns, size of core, and magnetic characteristics of the iron. A brief consideration of current transformer action will show this. If the resistance across the secondary of a current transformer is gradually increased, the secondary voltage—and therefore the flux density in the core—will increase. The secondary current, being the vectorial difference between the primary current and magnetising current, decreases. At first the voltage increases rapidly and the current decreases only slightly—the output, being the product of the two, therefore increases. As the flux density nears saturation, the consequent quick growth of magnetising current causes the secondary current to drop sharply, whilst the voltage grows only slightly. The output, therefore, begins to fall away, and gradually dies to zero at infinite resistance. A curve showing the relation which exists between output and secondary resistance is given in fig. 4.

If a protective transformer will not give the output required the trip coil will not operate, and the whole gear will be useless. Difficulty is most often encountered with bushing-type current transformers working on low primary currents. The only remedy, if wound-type transformers are not permissible, is to increase the sectional area of the core, if possible without increasing the length of magnetic path. The use of mumetal does not generally help, except at extremely low currents, since the flux density at maximum output is usually in excess of the saturation density of mumetal.

Whilst overload protection is often used as a last line of defence, it suffers from many disadvantages. As the trip coils must be set to operate at a current greater than the maximum load allowable, fault current, when the protected apparatus is on light load, must grow to a value exceeding the full-load current before tripping occurs. Further, in the case of feeder protection much more of the system may be shut down than is necessary.

Balanced Protection Systems

These disadvantages can be eliminated by using one of the balanced systems of protection, perhaps the best known of which are the self-balancing and Merz-Price. In the former, the incoming and outgoing leads of the protected apparatus are passed through a common ring-type current transformer. Under fault conditions more current passes through one lead than the other, causing current to flow in the secondary of the current transformer, this operating a relay, with consequent tripping out of the faulty apparatus. The Merz-Price method is somewhat similar but two current transformers are used, one in each line, and their secondaries are cross-connected so that normally no current flows in the relay circuit. A fault in the line causes dissimilar secondary currents, and the difference between the two is forced through the relay.

Balanced protective gear should not operate on through faults, *i.e.*, those due to heavy overloads caused by faults on more remote apparatus. With self-balancing protection, no matter what the overload is, as long as the incoming and outgoing currents balance there will be no current in the secondary of the current transformer. In the Merz-Price system we depend on the constancy of the ratios of the two current transformers to provide equal secondary currents. This may not hold at heavy overloads unless the current transformers are identical in design.

When the primary current of a current transformer is increased beyond its rated value, the secondary current and voltage also increase, at first proportionally (fig. 5). This goes on until the flux density in the core reaches saturation point; after this the voltage, and, consequently, the secondary current, cannot increase any more, any further increase in primary current being lost in magnetising the core. Thus the secondary current has a definite maximum value depending on the design of the transformer and the magnetic characteristics of the core.

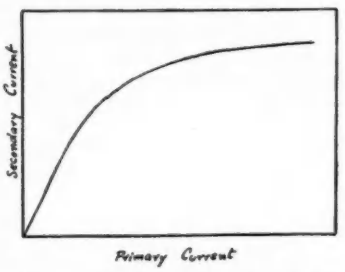


Fig. 5.—Saturation curve of current transformer

Current transformers for Merz-Price gear must have the same saturation current, otherwise tripping will occur on heavy overloads.

This is best accomplished by using transformers having cores of identical design and the same number of ampere-turns. When alternators are being protected this is easily arranged, since the incoming and outgoing currents are equal. Thus it is only necessary to use similar current transformers throughout, which would probably be the procedure in any case. Power transformer protection is a different proposition, since the incoming and outgoing currents are inversely proportional to the voltage ratio. The best plan is to use bar-type current transformers on the l.v. (heavy-current) side and wound-type transformers on the h.v. side having similar cores and ampere turns.

Public Electric Clocks. By T. R. Robinson

THE popularity of the public clock as a form of ornament for a building, or as a medium of publicity, seems to be on the increase. Many of these clocks are particularly attractive, combining neatness and service in a very pleasing manner. One of the most noticeable features of these installations is that in practically every case electrical operation has superseded the older mechanical method and has often enabled designs to be produced which were not possible before. Both the half-minute impulse and synchronous-motor systems have been extensively used, and both give remarkable flexibility and simplicity of control, while the maintenance and attention required by the clocks is so small as to be negligible.

One of the most ambitious of new clocks is the Westminster quarter-chime clock on a Houndsditch warehouse. This installation not only includes a handsome bracket clock and a quarter-chiming and hour-striking gear, but also possesses a chime of bells, on which tunes are played daily by means of a keyboard or clavier. There are two dials in a specially designed bracket, each being 3 ft. in diameter and provided with half-minute step-by-step movements actuated by a master clock located within the building. Special dials and hands designed to harmonise with the rest of the decoration are used and arrangements have been made for internal illumination.

On either side of the projecting dials appear the two figures of Gog and Magog, both 6 ft. high, and Magog is made to strike the hour bell by an assembly of crankwork and connections. Above the figures is mounted the main framework containing the twelve bells arranged in three vertical rows and so distributed as to give a good balanced appearance. An ornamental bronze grille in front of the steel framework supports the bells and leaves them visible.

Electric Striking Gear

The two electrical movements used for sounding the hours and quarters are housed inside the inner portion of the steel bell-frame, and are controlled by the master-clock. A special "let-off" panel equipped with step-by-step mechanism controls the motor circuits, and at the appropriate moments the trip arms controlling mercury switches are dropped by pins spaced around the rim of the stepped wheel. The units are made up of motor-driven worm gears, mounted on box beds and operating through final spur gearing. The hour-striking unit carries a single snail cam for lifting its single hammer, but the quarter unit is fitted with a barrel built up of rings of cams. This method was used on account of the strength obtainable, and the ease of maintenance and adjustment.

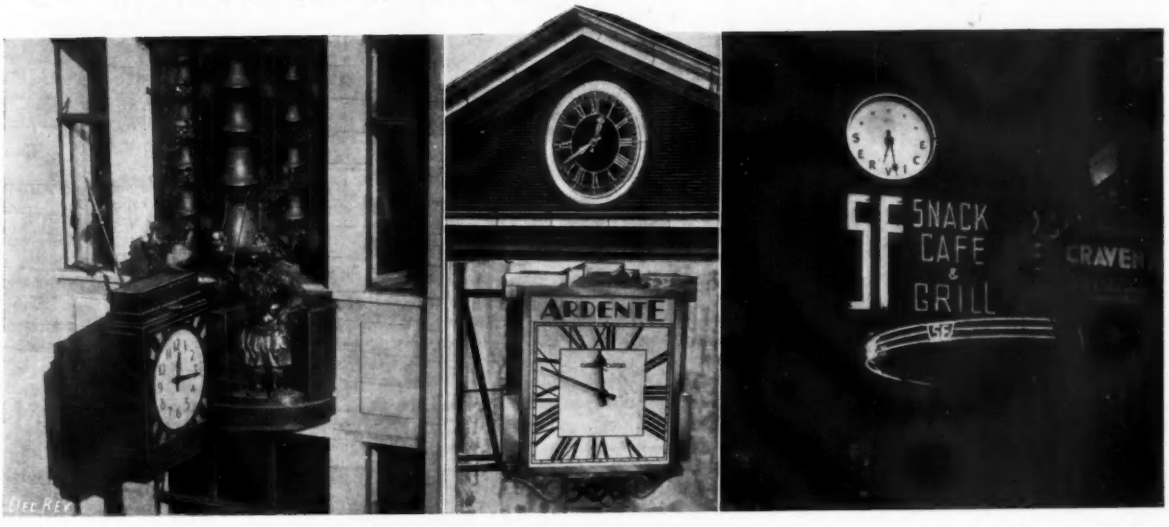
The quarter-chiming hammers are coupled direct to their unit by cranks of the normal type, but the hour-striking hammer, being operated by the figure of Magog, is connected to its unit through the moving arm of the figure. The actual hammer is mounted centrally and immediately over the hour bell, and its head is made in the form of a battle-axe. The control of the sounding of the hours and quarters on the driving units is determined by suitable count-wheels, which are provided with pins to trip the motor switches at the completion of the sounding of the proper quarters or hours. The count-wheels are themselves stepped forward a tooth at a time by cams mounted on the main spindles of the units.

The other bells are arranged for tune playing through a separate set of hammers altogether. These are operated from a hand keyboard situated at the rear of the bell frame through crankwork and levers, and an exceptionally light touch is obtained. The compactness of the whole assembly is notable. All the units, including the bells, are fitted into a remarkably small space, and the action of the mechanism, enclosed in a glass case inside the building, is of great interest to customers.

"Synthetic" Chimes

Another clock of a novel kind is a feature of Messrs. Ardente's Oxford Street building. The two square dials appear on a chromium-plated bracket, which also houses loud speakers through which the quarters and hours are sounded from an internal sound-amplifying mechanism. The clock dials are of a very distinct type and are made of glass, the figures and hands being black on a white ground. The method of operation in this case is by a synchronous a.c. motor fixed inside the building and arranged to drive the hands by bevel gearing of the usual form.

At a convenient point in the building there has been installed a second clock, also of the synchronous type, and this acts as a warning clock for the switching in of the sound apparatus dealing with the chimes. At exactly the correct moment the main amplifying panel and the necessary pick-up attachment are energised and the notes of the chimes and striking, obtained from a gramophone record, are put out over the feeder lines to the speakers located inside the case of the bracket-clock. The result is the production of the sound of a huge turret clock without any of the gear usually employed, and the novelty of the whole arrangement has attracted considerable public notice. This system would seem to have great possibilities, especially in positions where the space is limited or where the weight of large bells is out of the question. The speakers used are of the moving-coil type, and the method by which they are housed in the handsome bracket without either cramping the speakers or upsetting the symmetry of the bracket is ingenious.



Four of the Latest Public Electric Clocks

1. The Houndsditch warehouse clock. 2. The Middlesex Hospital clock by day. 3. The Ardente clock. 4. The clock at the "S.F." snack bar.

A clock of an extraordinary type is the new timepiece on the Middlesex Hospital. This is a silent clock, and the special feature in this case is the way in which the dial is made to change its appearance in order to be pleasing both by night and by day. During daytime the clock displays a gilt skeleton dial and hands against a black background, but when darkness falls the change is made to a black skeleton against a white ground. The method of achieving this change is to glaze the spaces in the skeleton dial with plain transparent instead of the usual opal glass and to mount a white sheet behind the dial opening.

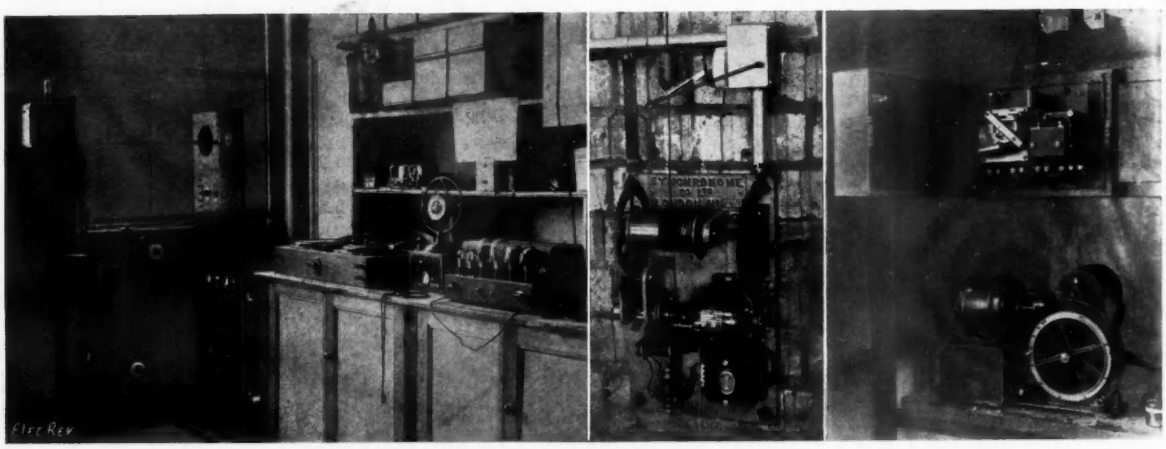
The sheet hangs from a movable carriage running on inclined rails and its weight would normally cause it to move down the rails and away from behind the dial opening. Attached to the carriage is a line which passes over suitable pulleys and is wound upon a drum forming part of the motor-operated assembly. The winding-in of the line will move the sheet across from its position of rest to a point where it will

appear behind the dial, and the completion of the circuit through the small motor on the operating panel is all that is necessary to move the sheet. Interposed between the drive from the motor and the winding drum is a small clutch, and this in turn is controlled by an electro-magnet. The energising of the magnet will free the clutch and allow the gravitational pull on the sheet and its carriage to move it back to the original position. The lighting of the sheet is by small flood lamps located behind the skeleton dial, a method that causes the skeleton to stand out in sharp dark relief at night, while in the daylight the gilt figures and hands also show to advantage against the dark ground.

The control of the sheet is coupled through relays to the switch closing the circuit through the dial lamps, and all that is necessary is for the attendant to turn over the switch in his office. This immediately closes the motor circuit by the tripping of a mercury relay and the sheet is moved to its position behind the dial opening. As it reaches the correct position a block attached to the line trips a two-way switch and opens the motor circuit. The movement of the switch also closes the first pair of contacts of the circuit through the release magnets of the clutch and all is then ready for the final contact to be made by the relay at the moment when the dial lights are switched off. The clutch is then withdrawn and the sheet moves away from the dial. As this movement is concluded the two-way switch is returned to its first position, breaking the circuit through the clutch magnets and making the first contacts for the motor once more.

The hands of the clock are operated by a step-by-step movement included in the circuit of the master clock controlling the whole of the rest of the dials throughout the hospital.

The final example is very much simpler, but is most unusual. It consists of a synchronous bracket timepiece erected on the front of the "S.F." snack-bar close to Piccadilly Circus. The dials are surrounded by neon tubing and are also arranged for internal illumination, but the chief feature is the novelty of the hands. These represent the arms of a tennis player, and the body and legs of the figure are depicted on the dial plate. The minute hand is shown by one arm extended and holding a racket, while the hour hand is formed by the other arm held close to the body and gripping a number of balls. The effect is quite remarkable and cannot fail to attract considerable attention.



Some of the Operating Gear
Left, the microphone, gramophone and amplifying equipment for the Ardente clock. Centre, the blind-operating gear of the Middlesex Hospital clock. Right, the hour-striking gear and release timing panel of the Houndsditch clock

The various types of electric clocks described above show how wide is the field of electrical timekeeping and how many are the novelties made possible by its use, but they are only a few of the strange timekeepers in use, for the demand for something new is continually leading makers to develop fresh ideas. The makers of the timepieces mentioned include some of the best known names in the industry. Messrs. Gillett and Johnston, Ltd., were responsible for the Houndsditch clock, while Garrard Clocks, Ltd., produced the Ardente timekeeper. The Synchronome Company made the Middlesex Hospital timepiece and the S.F. snack-bar clock is by Synclocks, Ltd. These concerns gave their assistance in the preparation of this article.

The Late Sir George Sutton, Bt.

WE regret to record the death, which occurred on Monday last, of Sir George Sutton, Bt., M.I.E.E., president of W. T. Henley's Telegraph Works Co., Ltd. Sir George was occupied with the affairs of the company about ten days previously, but he had a heart attack, and after a few days' illness he died at his residence, Park House, Walmer, Kent, at the age of seventy-seven, at 4 o'clock on Monday afternoon.

The whole of Sir George's business career was concerned with the affairs of Henley's and associated companies. He began in the City as secretary to the company when he was only twenty-four years of age—in March, 1881—when the concern was struggling through the period following the crash of the affairs of William Thomas Henley. The company, however, soon began to recover, and its progress has been continuous ever since. Submarine telegraph cables formed a large part of the work of those days, and to young Sutton it fell to negotiate all the earlier contracts for such cables, contracts which helped to put the business on a sound financial basis. In 1886 he was appointed manager of the company, and in 1893 he joined the board and became managing director. For some years, when Mr. Sydney Gedge was chairman of the company, it used to be the practice for Mr. Sutton to follow the opening speech with a spirited review of electrical developments in the home and overseas markets.

When he was appointed chairman of the company in 1918 he retained his old position of managing director, but voluntarily relinquished it in 1927. In April, 1932, he retired from the chairmanship and at the wish of his fellow-directors became president. He was made a baronet in 1922, the occasion being marked by the presentation to him of an illuminated address to which every member of the staff and every employé at the works and branches contributed. Some years before (in 1910), the shareholders had presented him with his portrait painted by Sir Luke Fildes. In December, 1926, the directors and staff presented him with a gold cigar box on his retirement from the managing directorship, and in May, 1931, when he had completed fifty years' service, he received a gold casket from the staff.

[Elliott & Fry
The late Sir George Sutton, Bt., president of Henley's

Sir George was one of the founders of the Cable Makers' Association, which was formed in 1900. He was also deeply interested in the work of the Royal Society of Arts, and was a vice-president. His interest in the Society took a very practical and substantial form. He was a director of Henley's Tyre & Rubber Co., Ltd., Henley's (South Africa) Telegraph Works Co., Ltd., and the Enfield Rolling Mills, Ltd. He was responsible for the inauguration of the staff pension fund in 1916, and was in various ways interested in the affairs of the staff and employés.

Lady Sutton died several years ago. There is no heir to the baronetcy. The funeral ceremony will take place to-day (Friday) at 2.40 p.m. at St. Luke's Cemetery, Bromley Common. A memorial service will be held on Monday next, May 7th, at 11 a.m. at the City Temple, Holborn Viaduct.

Lamp Testing. By J. W. T. Walsh, M.A., D.Sc., M.I.E.E.

The new British Standard Specification

THE new specification for "general service" tungsten-filament lamps, just issued by the British Standards Institution (B.S.S. No. 161-1934), differs in several important respects from that which it supersedes. The old specification was intended to form the basis of a contract, whereas the new edition provides (Clause 11) definite means for testing the general quality of lamps sold on the open market—the test to be carried out by an independent authority, approved by the B.S.I., on a batch of new lamps purchased through the ordinary trade channels without notice to the manufacturer or supplier.

A second important difference is that whereas in the old specification the initial values of lumens, watts and efficiency (lumens per watt) at rated volts, were each to lie within pairs of limits tabulated for the various ratings, in the new one limits are now prescribed for the initial lumens and the test is based on initial watts and efficiency. Further, the new limits refer to the *average* values for the whole test quantity and not to the figures obtained for any individual lamp. To ensure that individual lamps do not show too wide a departure from the average a maximum "coefficient of variation" is prescribed for all the lamps in a given rating test quantity. This produces greater uniformity among the individuals comprising any given batch of lamps* although individuals from different batches may spread even more widely than under the old specification. The figures of efficiency given in the tables show a general increase over those previously specified.

A third change is that life tests must be carried out at rated voltage instead of at rated efficiency. The average efficiency of the whole life test quantity must be within one per cent. of the average efficiency of the rating test quantity, and individual lamps must not show differences from that average greater than the specified coefficient of variation. Further, the life of the lamps as actually observed is to be used to compute the theoretical life which would have been obtained if all the lamps had been run at standard efficiency.

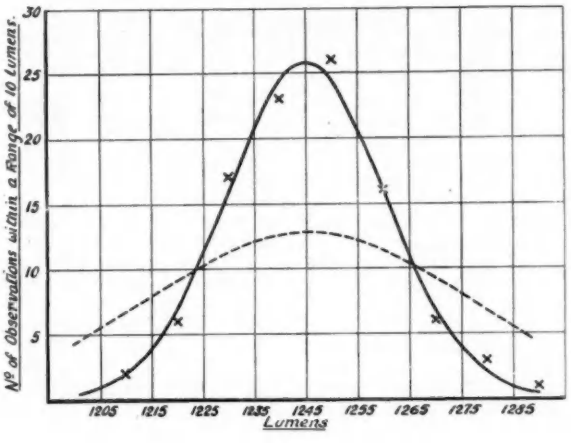


Fig. 1

This permits the same tolerance as hitherto in design; a lamp with a higher efficiency (within the prescribed limits) may have a shorter life and still fulfil the requirements of the specification as easily as a lamp designed to operate at a lower efficiency and have a longer actual life. The average *efficiency* throughout life must not fall below a certain tabulated figure, instead of the previous requirement of a certain lumen maintenance throughout life.

Uniformity and the "Coefficient of Variation"

The old specification permitted the individual efficiencies to lie anywhere within a certain range; the new specification, however, prescribes (a) a definite closeness of grouping of the individual values about a mean, and (b) a definite range within which this mean must lie. The "closeness of grouping" is expressed by a figure (the "standard deviation") used by statisticians to describe the closeness with which the individuals' values in a group of observations cluster about the average of the group.

The observations of each of a number of experimenters will cluster about the average of all the figures obtained by him and his performance can be represented by a "frequency diagram," in which the axis of abscissæ represents values of the quantity measured. If X is the arithmetic mean of all the observations, an ordinate proportional to the number of individual results lying between X and (X+d) is erected at the point (X+½d.). Similarly at (X+3d/2) an ordinate is erected proportional to the number of observations lying between (X+d) and (X+2d). The same thing is done at (X+5d/2), (X+7d/2), &c., until the number of observations lying within the interval considered is negligible. A similar process is then carried out for the observations less than X, *i.e.*, those lying respectively between the pairs of values X and (X−d), (X−d) and (X−2d), (X−2d) and (X−3d), &c.

[Elliott & Fry
Dr. J. W. T. Walsh

As an example, the distribution of 100 readings of lumens, taken at intervals of 10 lumens between 1205 and 1285 by an observer measuring a 200-V 100-W lamp, was 2, 6, 17, 23, 26, 16, 6, 3, with one observation higher than 1285 lumens. The frequency curve drawn from these figures is shown by the full line in fig. 1. If the number of observations had been very much greater, the points would have been still closer to the curve, which is the theoretical frequency curve representing the distribution of an infinite number of observations.

This curve is symmetrical about the ordinate drawn at the mean value X, and its "breadth" shows graphically how widely the individual observations are spread on either side of this mean. If another, less skilled, observer made 100 measurements on the same lamp, using the same apparatus, the mean of his values would be very close to X, but the frequency diagram plotted from them in the same way would be something like the broken-line curve, as his observations would spread more widely on either side of the mean. A figure calculated from the observations so as to express their "spread" (as shown by the "breadth" of the frequency curve) is a figure of merit for the observer.

The "standard deviation" is such a figure and is obtained as follows: (i) The arithmetic mean of all the observations is ascertained. (ii) The difference between each individual observation and the arithmetic mean is squared. (iii) The sum of the squares obtained in (ii) is divided by the number of observations, giving the average value of these squares. (iv) The square root of the number obtained in (iii) is the required standard deviation, *i.e.* $\sigma = \sqrt{[\Sigma(x-X)^2/n]}$ where x is the value of any single observation, X the mean of all the observations, n in number. The ratio of σ to X, often expressed as a percentage, is known as the "coefficient of variation."

There is an obvious analogy between (*a*) the standard deviation of a set of observations, regarded as a measure of the skill of the observer, and (*b*) the standard deviation of the values of efficiency (lumens per watt) at rated voltage of a group of lamps, regarded as a measure of uniformity of the batch they represent. This is the measure adopted in the new specification. Table II of the specification, which gives limiting values (i.e. absolute maxima and minima) for the average initial efficiencies at rated volts, of the lamps in any given

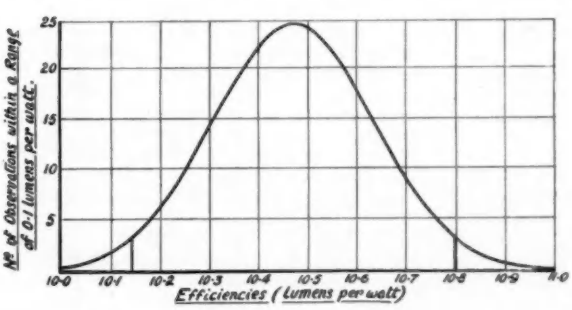


Fig. 2

* The term "batch" is defined as all the lamps of one class ordered at one time, or, at the option of the purchaser, all the lamps of one class put forward in one lot for acceptance, or all the lamps of one class which are subjected on one occasion to test for compliance with this specification.

rating test quantity, includes also a column of coefficients of variation which must not be exceeded in the individual values of efficiency found for these lamps. These coefficients range from 3 to 4½ per cent., according to the rating, and the lowest coefficient applies to those ratings which makers regard as their most uniform product, viz., the high-voltage lamps ranging from 40 to 100 W.

The portion of the clause dealing with this subject (Cl. 13b) reads as follows:—"The coefficient of variation of the initial efficiencies of the lamps in any test quantity shall not exceed the value given in Table II of the appropriate Schedule except in the case provided for in 11 (b) (when all the lamps in a batch are not tested, but only a selection from them), when that value shall be increased by one unit." A rating test quantity of 100 230-V, 75-W lamps showed an average efficiency of 10.47 lumens per watt.

The sum of the squares of the differences between the individual efficiencies and this average of 10.47 (ignoring the signs of the differences) was 2.6865, and therefore the standard deviation is equal to $\sqrt{0.026865}=0.164$. The coefficient of variation is thus $0.164/10.47=1.57$ per cent. Since the prescribed coefficient of variation for lamps of this rating is 3 per cent., and the limits laid down for the average efficiency of the rating test quantity are 11.30 and 10.00 l/W, the lamps comply with this part of the specification.

The Limits of Variation

As the work of calculating the coefficient of variation for a number of lamps is considerable, a note has been added to clause 13 stating, in effect, that the coefficient of variation will probably be within the prescribed limits if not more than one-twentieth of the lamps give figures which differ from the average for the rating test quantity by more than twice the coefficient of variation. This is a statistical "approximation," the accuracy of which increases with the number of lamps in the rating test quantity. Its justification is to be found in the form of the "theoretical" frequency curve in Fig. 1, the mathematical expression of which is $y=(N/\sigma\sqrt{2\pi})e^{-a}$, where $a=(x-X)^2/2\sigma^2$, N is the total number of observations, σ the standard deviation, X the arithmetic mean of the observations and e the base of natural logarithms (2.71828). The frequency curve for the figures of efficiency given in the example just quoted is shown in Fig. 2. Here $N=100$, $\sigma=0.164$, and $X=10.47$.

The *area* of the curve between any two ordinates is proportional to the number of observations lying between the values of x at which those ordinates are drawn. The factor of proportionality is obtained by noticing that the total area of the curve represents the total number of observations. If an ordinate be drawn at the value of x for which $(x-X)$ is twice the standard deviation, the area of the tail of the curve lying beyond that ordinate is equal to 0.0227 of the total area. Similarly, since the curve is symmetrical about the ordinate through X, the area of the curve to the left of the ordinate given by $X-x=2\sigma$ is also equal to 2.27 per cent. of the total area. These ordinates have been drawn in Fig. 2 for the frequency curve corresponding to the figures derived from the rating test quantity referred to above.

Since only 4.54 per cent. of the total area of a frequency curve lies outside the ordinates whose distance from the mean is twice the standard deviation, it may be assumed that when not more than 4.54 per cent. of the figures in any set of observations differ from the mean by more than twice any specified standard deviation, the whole set of observations has a standard deviation not greater than that specified. This is analagous to the case dealt with in the specification, and 4.54 per cent. is, to all intents and purposes, the "one-twentieth" referred to in the "note" to Clause 13. The standard deviation in the case considered being 0.164, any individual difference of 0.33 or over exceeds twice the standard deviation. Six out of the 100 figures of efficiency showed such a difference, but in one case the difference was exactly 0.33. In any case, the rule is only an approximation, even for 100 lamps.

Life Tests

It is now stipulated that the lamps in the life test quantity shall have, on the average, the same efficiency as the lamps in the rating test quantity within one per cent., and that they shall be considered to have failed as soon as the efficiency drops to 75 per cent. of its initial value. This entails calculating the efficiency of each individual lamp at each test period,† although the conclusions to be drawn from the life test are based on the *average* performance of all the lamps in the life test quantity.

Finally, the test is to be continued for 1,000 hours, less an allowance depending on the number of lamps. If the total lumen-hours of all the lamps divided by the total watt-hours is not less than the "standard average efficiency throughout life" given for the appropriate rating in Table II of the specification, then the lamps satisfy the requirements as to life. If the average efficiency to this period is less than this standard average efficiency the life test is continued for a further period, and an "equivalent life" is calculated from this extended actual life and from the observed average efficiency throughout this extended life, using the following formula:—

$$\left\{\begin{matrix}\text{Equivalent life at}\\ \text{std. av. efficiency}\end{matrix}\right\} = (\text{observed life}) \times \left\{\frac{\text{Actual av. efficiency}}{\text{Std. av. efficiency}}\right\}^n$$

where $n=6$ for gas-filled lamps. If the "equivalent life" thus calculated is not less than the required minimum the test is discontinued, as the lamps satisfy the conditions; otherwise the test is continued for yet another period.

This process is repeated until the average efficiency throughout the actual life has fallen to a certain figure given in Table II of the Specification under the heading "minimum average efficiency throughout life." At this point the test is stopped, and if the "equivalent life at standard average efficiency" is still below the minimum the lamps fail to pass. Life testing measurements may be made at periods not exactly equal to those specified. So long as the departure does not exceed about ten hours it may safely be ignored.

The following example shows the particulars required before the life test is begun:—Lamp rating, 220 V, 40 W; limits on average initial efficiency, 9.15 to 7.95 lumens per W; coefficient of variation, 3 per cent.; standard average efficiency throughout life, 7.69 lumens per W; minimum average efficiency throughout life, 7.39 lumens per W; average initial efficiency of r.t.q., 8.65 lumens per W; number of lamps in l.t.q., 15.

From these data: (*a*) the average life at standard efficiency (7.69) must be not less than 1,000 hours, less the allowance given in Table IV of the specification for 15 lamps (10 per cent.), i.e., 900 hours; (*b*) the average initial efficiency of the l.t.q. must lie between 8.65±1%, i.e. between 8.75 and 8.56 lumens per W, and the initial efficiency of each lamp in the l.t.q. must lie between 8.65±3%, i.e. between 8.91 and 8.39 lumens per W.

Tabulation of Life-test Results

The results obtained during a life test are tabulated separately for each lamp in such a way that the lumens per watt, the total lumen-hours and the total watt-hours are shown at each test period. Watch is kept on the efficiency so that the lamp may be removed from the test if its efficiency drops to 75 per cent. of the value it had initially.

A separate table contains, for *all* the lamps in the life test quantity, (*a*) the hours run, (*b*) the total lumen-hours, and (*c*) the total watt-hours. These figures are entered from the tables for the individual lamps as soon as the 1,000-hour period has been completed. These three sets of figures are summed, and from them are calculated the average life and the average efficiency throughout life (total l.h./total Wh.). If the former figure exceeds 900 and the latter figure exceeds 7.69 (the standard average efficiency throughout life in the example quoted), the lamps pass. If either figure is too low the lamps are run for a further period.‡ and the average life and average efficiency throughout life are calculated for this extended period.

The equivalent life at 7.69 lumens per watt is then calculated by the formula quoted above § and, if it is not less than the 900 hours required, the lamps pass.

† The test periods are now 0, 100, 250, 500, 750, 1,000 hours.

‡ The approximate figure indicated in the Specification for this extra period is "80 hours . . . 350 hours."

§ The Specification contains a table which may be used to facilitate this calculation.

"Osira" Lighting in Industry

WHEN the high pressure electric discharge mercury lamp was introduced for street lighting just over a year ago it was too bright for ordinary industrial work except in cases where ample suspension height was available. The G.E.C. is now in a position to recommend "Osira" lamps for industrial lighting where there is ample height, no fast moving machinery, and strict colour discrimination is not involved in any processes. One of the first installations carried out has been that at Messrs. Leys Malleable Castings, Derby. This foundry was previously lighted by 1,000-W incandescent lamps in dispersive reflectors; 400-W "Osira" lamps were installed in the same reflectors in one section of the bay, and their light compared with that obtained previously. The experiment proved that not only was the intensity of light as high and the distribution as satisfactory, but also demonstrated that for work of this class the colour of the light was a definite advantage in that it enabled the detection of flaws, both in sand moulds and in finished castings, to be made far more readily than was possible under the old lighting. As a direct result of these experiments an order has been placed by Leys Malleable Castings for a further seventy "Osira" lamps and gear complete, as a first instalment towards the relighting of the whole foundry.

From Submarine to Power Cables

A new departure by the T.C. & M. Company

AN organisation that has acquired a reputation which is as world-wide as that of the Telegraph Construction and Maintenance Co., Ltd., needs no introduction. This company has been in existence for about seventy years, and claims to have played a major part in the manufacture and laying of 75 per cent. of the world's submarine telegraph cables.

But the demand for deep sea cables has unfortunately declined so that their manufacturers have had to partly divert their activities into other channels. In this way the T.C. & M. Co. has turned to the manufacture of paper-insulated cables for lighting and power distribution services.

In welcoming area sales representatives, after a tour of the new works on Monday last, at luncheon on board the C.S. *Dominia* (a sturdy vessel with a well-known cable-laying record, now commanded by Capt. Bell), Sir Geoffrey Clarke, C.S.I., managing director, pointed out that though they had embarked upon a new venture the company's experience of cable making was extensive and mature. The rectification of cable faults at sea was so costly a procedure as to make the use of the best of materials and workmanship obligatory, and from that principle they did not intend to depart in the production of land cables. They were not in the "ring," preferring to stand on their own feet.

In returning thanks on behalf of area representatives, Mr. A. Caldwell Young (Scotland) assured the company that, although it might have been somewhat late in launching its new venture, it was not too late to enlist the wholehearted co-operation of the sales organisation.

The New Greenwich Works

The spacious new factory represents a considerable addition to an already extensive works. The single-storey premises have been designed on modern lines for the quantity production, under the management of Mr. L. J. Ransom, of the various types of paper-insulated cables for light and power distribution up to 33 kV, while the lay-out of the equipment is such as to enable it to meet 66-kV requirements when necessary.

The cable cores are made of high conductivity copper, drawn down in the new factory from electrolytic rods into wire form. The coils of wire are annealed in a continuously operated furnace and are then stored preparatory to use in a constant temperature chamber to prevent the accumulation of moisture. From this store are drawn the requirements of the wire stranding machines, which build up conductors to form cable cores of circular or sector formation in one continuous operation, the insulating paper being machine wrapped round the copper conductors with an even tightness which results in a close approach to homogeneity.

The drying and impregnation of the dielectric are critical operations in the manufacturing cycle, and the plant installed for these purposes incorporates the latest developments in the evacuation and hot-pressure soaking processing system. Both the paper and carefully blended compound are rendered free from moisture and gases before they are permitted to come into contact, while the actual impregnation of the insulating paper takes place under a pressure of compound. Since the plant circuit is continuous and sealed, the retention of the desired conditions is assured.

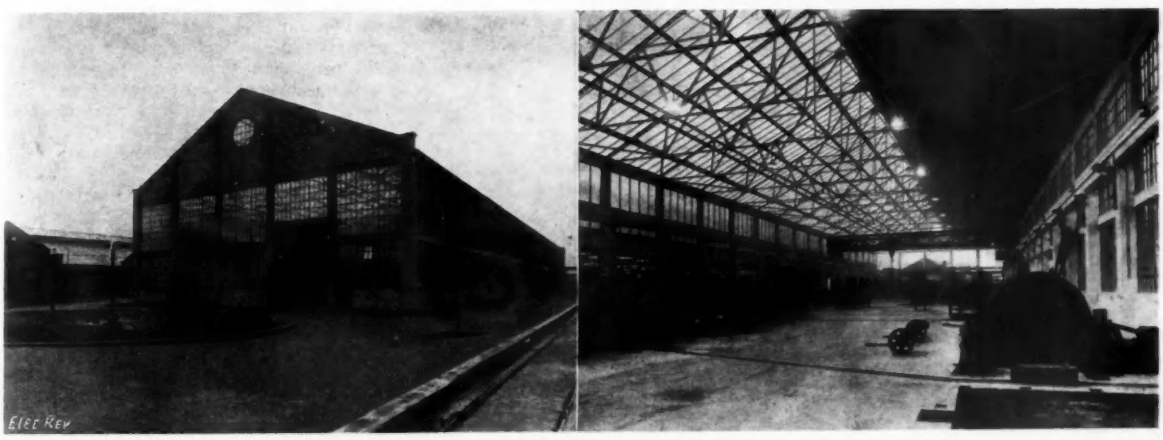
Lead-covering and Armouring

Next in order is the application of the lead sheath. Cables of all usual diameters can be covered by a lead press of Henley's straight-through type, which eliminates the old weaknesses of longitudinal seams and butt joints in the sheath. The serving and armouring machines installed in the new factory are capable of applying any required form of protecting wires or tape, with many and varied under and overall servings, to the lead sheath in one operation. Each respective layer of armouring is treated with a waterproof and preservative compound, so that the finished cable is completely insulated, not only electrically, but also externally against chemical and mechanical sources of damage.

Built and equipped within seven months, the new East Greenwich works have been planned for unhindered flow from stage to stage, being, of course, electrically driven and lighted throughout. Careful selection of materials, checking of processes, and testing of products proceed under that experienced scrutiny which has given "Telcon" submarine telegraph cables their world-wide reputation.

Besides cables the company is producing the principal accessories such as straight-through joint and service boxes, indoor and outdoor terminal dividing boxes, outdoor fuse and dividing boxes, and distribution pillars, with interiors of standard units for 2, 3, 4 or 5-core cables. All units can be supplied with standard fuses of various makes, or fitted with link or knife switches as alternatives. All pillars can be fitted with cast-iron lamp columns and street lighting brackets to suit customers' requirements.

Impregnated tapes for joint insulation, and compound for box filling, are also manufactured at the company's works.



Exterior and interior views of the T. C. & M. Company's works extension

The New Lamp Specification

THE British Standards Institution has issued a revision of the Standard Specification for tungsten filament electric lamps for general service. The remaining schedules for traction lamps, train-lighting lamps, bus lamps, navigation lamps and road traffic control light-signal lamps, will be issued as a separate Specification No. 555-1934. The new Specification differs principally in three ways from the 1932 edition, the changes having been made possible by the much higher degree of uniformity in initial efficiency and life to which individual manufacturers to-day can produce lamps, although the life characteristics of different makes still differ slightly.

First, the revision calls for a more definite and higher degree of uniformity in the rated efficiency and therefore in life at rated volts of the lamps in any batch. The average watts consumption and the average initial efficiency of a batch of lamps have also to fall inside definite limits. The greater uniformity has also permitted a considerable reduction in the sampling tolerances of Table 4. The improved uniformity allows the life and quality tests to be carried out at rated volts, so that the user will now obtain with lamps conforming to this revised Specification a definite security for a minimum average life of 1,000 hr. at rated volts; this allows for simplification of life testing plant and procedure. Thirdly, it guarantees a standard of quality which is higher than that of the 1932 issue and which also equitably accommodates lamps of slightly different candle-power performance during life. The standard of quality is defined in terms of an *average* efficiency throughout a life of 1,000 hours. The average quality, so defined, of a batch of lamps must be above a specified value. Copies of the Specification (B.S.S. No. 161-1934) may be obtained from the British Standards Institution, 28, Victoria Street, S.W.1, price 2s. 2d. post free.

MEETINGS AND DISCUSSIONS

Current Topics and Opinions Expressed at the Institutions

Electrical Phenomena at Low Temperatures

THE twenty-fifth Kelvin Lecture was delivered by Prof. J. C. M'Lennan at the INSTITUTION OF ELECTRICAL ENGINEERS in London on April 26th. In this the lecturer explained how the better understanding of the technique of gas liquefaction had simplified research and enabled very low temperatures to be obtained. Temperatures as low as 0.72 deg. absolute (−272.28° C.) had been obtained and now that the mechanism of the problem was well understood it was simple to produce and control these temperatures, to subject to their influence various known substances, and study their electrical phenomena. At ordinary temperatures various substances could be divided electrically into two categories, insulators and conductors. Under normal conditions oxygen was the best known insulator and at extreme limits of low temperature this property was maintained. An atom of oxygen or hydrogen had a well defined form, consisting of a nucleus and ions at their known respective orbits. Whatever the temperature to which these gases were reduced the spectrum showed that the formation remained unchanged, resulting in the retention of the insulating property. In the vast majority of conductors the electrical resistance fell according to a straight-line law with decreasing temperature.

Professor J. C. M'Lennan

If, therefore, the temperature was reduced to an extremely low limit one would expect that at a given temperature the resistance would have gradually fallen to zero. This was true with a very important exception and that was, that at a certain temperature varying from 1-9° absolute, which temperature depended upon the metal, the resistance suddenly fell to zero and the metal became a superconductor. Linear contraction did not show any point of sudden change, but continued as a constant; it had been found, however, that the specific heat suddenly rose at the point of change of resistance.

It would seem to follow that if any given conductor were reduced to its critical temperature and a current caused to flow in that conductor, the current would continue to flow indefinitely so long as the temperature condition was maintained. A current did flow under those conditions. It could be started by induction, but it did not distribute itself throughout the section evenly. It crowded towards the outer edges, and in the quest for solutions to these problems experiments were being carried out by covering conductors with extremely thin coatings of tin or copper, of a thickness of the order of from 20 to 200×10^6 mm., and these experiments showed that it was definitely a film phenomenon, but the mechanism still remained unknown.

The Effect of Frequency

Up to now the phenomena described had been the results of experiments carried out with direct current. Further tests had been made with a.c. and with a.c. superimposed upon d.c. The phenomena remain the same, the only point of difference being that a.c. slightly lowered the critical temperature. It appeared, therefore, that frequency had some bearing upon the phenomena, and experiments were still being conducted along these lines.

What were the corresponding magnetic phenomena? At ordinary temperatures some substances were paramagnetic, while others were diamagnetic. Experimental research had shown that if a conductor was placed at ordinary temperature in a magnetic field cutting through it, reduction of temperature to low extremes caused the field to spread away from the centre of the conductor towards the edges and at the critical temperature the field would leave the conductor altogether; in other words, it became impermeable. If instead of a solid conductor a hollow cylindrical conductor was subjected to a magnetic field, at the critical temperature the field would leave the conductor. It continued to exist, however, both outside and inside the hollow cylinder.

If our conception of magnetic lines was correct how did those lines join up and close? A step further revealed a more surprising phenomenon. If one removed the field from the outer periphery of the conductor, for no apparent reason the field in the hollow centre of the conductor still persisted in the the form of straight lines or chords in the same direction as the original field. Now as this field was bound on all sides by the inner periphery of the conductor our theory, in which Faraday himself believed, that all magnetic lines closed upon themselves was wrong, for if it was so where were the other ends of these lines?

The study of electrical phenomena at extremely low temperatures had brought up many problems the solutions of which were at present unknown. When they had been fully studied and answered we might be obliged radically to alter some of our present-day conceptions of electricity and magnetism. The exact nature of electricity was not as yet known, nor did we know why certain materials were conductors while others were insulators. Low temperature electrical research might provide us with a greater knowledge of the electrical mechanism of these substances and might be the road which would lead to a conception of what electricity really was.

Sir William Ray Talks to Farmers

ALTHOUGH entitled "The Application of Electricity to Agriculture," the paper by Sir William Ray, M.P., executive chairman of E.D.A., which was read at a meeting of the FARMERS' CLUB in London on April 30th, took it for granted that farmers were fully alive to the aid that electricity could give them in improving production and reducing costs. The centre of discussion was therefore shifted from the question whether they could be induced to realise the advantages of its uses to the question of how soon the facilities available in well-developed areas could be made universal.

The fact that this stage had been reached was, by the way, instanced as an effective contradiction of the common belief that British farmers were slow to adopt improved methods of working. They had shown themselves to be ready to consider electricity on its merits when brought before them in a practical form. They had revealed a very progressive spirit, said Sir William, for, though keenly critical, once the argument had been proved by demonstration under working conditions, it was frankly accepted, and the interest turned to the terms on which electrical service could be made available in rural districts.

Distribution Costs

While the grid might ensure a wholesale supply, the process of retail distribution had still to be reckoned with. The cost of constructing an overhead distributing main was between £200 and £300 per mile. If the rate per kWh sold were fixed high enough revenue could be made to cover the total capital investment, but this method would restrict the use of the service offered. To keep the price per kWh low an initial charge could be made according to the length of service main required per individual consumer.

This alternative principle, Sir William said, represented the most satisfactory method of adjusting the variations in service charges, which played a more prominent part in rural than in urban areas because of the greater distances that separated consumers. In the long run the consumers themselves determined the price at which they got their electricity, the supply of which was essentially a service in which co-operation was necessary for successful operation.

Some supply authorities might be more enterprising than others; some might be prepared to take bigger risks in the early stages of development; but ultimately the cheapness of electricity depended upon everybody becoming all-electric. The healthy stimulus of farmers' organisations pleading for wider availability of supply and some approach to a uniform tariff would fail to be of effect unless the economic factors mentioned above were borne in mind.

Cheap Electricity Essential

There was a large attendance and the paper provoked considerable discussion. Mr. Fred Smith (chairman of the Club) presided. Capt. J. M. Donaldson (North Met. Co.), proposing a vote of thanks to Sir William Ray, said the paper was a well-balanced statement of a very important problem. From the farmers' point of view he recognised that poles were very often a great nuisance, and he sympathised with those who could not obtain supplies from pole lines which crossed their property. Farmers did not seem to like hire-purchase and having a known liability overhanging their heads.

Mr. Alexander Findlay (Cardington, Bedfordshire), who seconded the vote of thanks, said the real want of the farmers was cheap electricity because only if it assisted to bring down costs could farmers be expected to use it to the fullest possible extent. He complained that in Bedfordshire there were variations in the charges according to the distance away from the centre of the supply, there being differences of as much as 50 per cent. As a strong advocate of the use of electricity on the farm, he urged greater co-operation between the agricultural engineer and the farmer, because once it was shown that the electric motor would do the work more efficiently and economically than the internal combustion engine, the farmer could be relied upon to adopt it. The price, however, must be low, and if the supply industry took the broad view and supplied now even at a loss, which would not hurt it very much, it would be to their ultimate advantage. Farmers had been selling their produce at cost price and even below it for ten years and were still living.

Too Many Authorities?

Lieut.-Col. Waley-Cohen, C.M.G. (Aldringbourne, near Chichester), also contended that in order to compete with other forms of power, electricity must do the work better and cheaper. In that respect the great need was for the reorganisation of the distribution side of the industry. Undoubtedly the high cost of electricity in the rural areas was due to the large number of distribution authorities which existed. He therefore urged the rationalisation of the distribution side of the industry. At the same time, the industry must pay greater care to the prevention of breakdowns in supply. He knew of some ten large farms which used electricity for every purpose except brooders and incubators because of the damage likely to be done by the supply breaking down, if it lasted for more than three hours.

Mr. R. B. Matthews said the two chief obstacles to progress had been (1) the difficulty of obtaining supplies in rural areas at a reasonable cost, and (2) the lack of suitable electrically operated farm machinery. Both these causes arose primarily from the fact that the agricultural machinery manufacturer and the central station engineer had failed to appreciate the enormous possibilities of the use of electricity in agriculture.

Sir H. Trustram Eve, K.B.E., said his experience of the rating of electricity undertakings had brought prominently to his notice the extraordinary variety of charges made for electricity supply. Living in the Bedford area, he spoke in terms of high praise of the efficiency of the supply and the low charges and of the work done by Mr. Phillips. The scheme had been guaranteed by the Government, but he did not think the Government would be called upon to contribute very much. Sir Trustram strongly urged that there should be uniformity of charge over individual supply areas and that rural areas should not pay higher rates than towns.

Obtaining Comparative Figures

Dr. Keen (Rothamsted experimental station), remarking that the great need at the present time was for comparative figures of the use of electricity and other forms of power on the farm, said the underlying idea of the all-electric farm at Rothamsted was to supply this information so that farmers could then, by a simple arithmetical calculation, find out the comparative costs according to their own particular conditions. Mr. F. E. Rowland (General Electric Co., Ltd.) said there were many motors hired out in the Bedfordshire area and there were hiring facilities in many farming areas. As to private generating plants, he contended that in most cases the capital charges and depreciation amounted to 1d. or 2d. per kWh. Breakdowns were not so frequent as they were in the early days. In any case he did not think the risk to incubators and brooders was any more than with oil lamps. He challenged the allegation that electrical plant manufacturers in this country were lacking in enterprise.

"Universal" Motors Wanted

Mr. W. Burkett (Bishop Auckland) suggested that greater attention should be paid to providing the farmer with one motor which would drive all the farm machinery. Motors should be entirely dust-proof, and machinery should be made as simple as possible. The chief trouble, however, was cost. Mr. R. M. Charley (English Electric Co.) also supported what had been said as to the availability of electrically operated farm machinery in this country, adding that co-operation between the manufacturers, the supply authorities, and users would help to solve many problems very much more quickly than was possible at present in the absence of that co-operation. The Chairman supported what had been said as to the need for low prices if electricity was to be used to the fullest extent on farms.

Sir William Ray, in the course of a short reply, said he had

The London School of Economics Extension

1. The library entrance and catalogue room. 2. The Haldane room. 3. Portable lamps for inspecting the shelves. 4. The Snead book conveyor. 5. Part of the all-electric kitchen.

learned a great deal from the discussion and due note would be made of the matters that had been mentioned. Reorganisation of the distribution side of the industry was a political matter and not one for the British Electrical Development Association. In recent years charges had fallen in many districts—in some to the extent of 50 per cent.—and he claimed that supply engineers were doing their utmost in that direction. As the demand increased, so prices would fall.

Supervisory Control for Large Power Networks

MODERN practice in Germany and on the European Continent with regard to supervisory control systems as applied to large interconnected electricity supply areas is the subject of the paper by Dr. Ing. M. Schleicher which was read before the INSTITUTION OF ELECTRICAL ENGINEERS in London on May 3rd. The paper first describes the development of the use of remote-control equipment on power systems, and then outlines the constitution and duties of the staff required for operating a large load-despatching plant.

The difficulties associated with the control of generation, particularly during peak-load periods, are next discussed, and the starting characteristics of various large turbo-generators installed at the stations of the Berlin municipal undertaking are given. Steam-accumulator sets, Diesel sets, and storage hydro-electric pumping plants, are relied upon in Continental practice to provide reserve power. In the operation of large systems, frequency meters are now being supplanted by remote-metering devices for use in balancing output and demand.

Load Despatching

Where a large number of generators feed into the network, both the individual outputs and the summated values for the various groups are transmitted to the load despatcher by the remote-indicating equipment. This is usually operated on the impulse-frequency system, either over pilot wires or by means of carrier-current circuits. Network compensation is obtained by adjusting the earth-leakage coils so that their inductance balances the total capacitance of the interconnected system. The necessary adjustments to the coils are made by local attendants under the direction of the load despatcher. Carrier-current telephony is commonly used for communication between the load despatcher's office and the various control points, on account of its lower cost and greater ease of fault location as compared with other systems.

Supplies to medium-sized towns, densely populated rural areas, and electric railways, are given from secondary networks, each of which is controlled from a district load-despatcher's office situated at a power station or sub-station. The results of remote control on such networks have been very satisfactory.

It is often found that development at first diverges from the originally conceived idea, but returns to it again in essence and conception when reaching completion. The birthplace of the load-despatching plant was really the main switchboard of the oldest and largest power station of a town. The control of the whole service was centred in the chief engineer, who was responsible not only for the perfect condition of his machines and entire distribution system, but also for the choice and operation of the generators so as to obtain the greatest economy. His duties therefore extended not only to technical but also to economic problems.

The present-day load-despatching plant, on the other hand, has a much greater resemblance to the original main switchboard. The functions of the engineer in charge are of a much higher order, more akin to the duties of the engineer of former times. He supervises the system, but delegates the work of manipulating apparatus and machines to local operators. His scientific training and experience qualify him to give advice in all matters regarding improvements and extensions.

* * *

Railway Train Lighting

The method of electrically lighting railway train coaches is dealt with in the paper by Mr. C. T. Gould, which was read before the London Students' Section of the INSTITUTION OF ELECTRICAL ENGINEERS on April 27th. To-day, each coach carries its own generator and batteries, and is thus entirely independent of external sources of supply. The generator, which is usually of the self-regulating type, is suspended beneath the coach and driven from a pulley fixed to a bogey axle. The pulley ratios are adjusted so that the maximum output is obtained at speeds between 15 and 20 m.p.h. for a suburban service, and at approximately 30 m.p.h. for fast runs. The machine is designed so that the direction of the drive does not change the polarity, an essential feature, as the coach may run in either direction.

In this country 24-V batteries of the lead-acid type are almost universally used. The capacity is usually fixed to give between seven and ten hours' lighting without a charge; the tendency is to keep the size of the batteries down to the minimum. With the double-battery system, which is the more common, one battery is on load while the other is being charged. An automatic device changes the battery on load each time the train stops, thus effectively balancing the loads on each. This system fails when individual lamp control is desired, but is excellent on local suburban services. With the single-battery system an externally regulated shunt dynamo is usually employed to supply the charging current, and a much more flexible system of supply is available. The paper describes in detail some of the better-known modern train-lighting equipments.

Radio Interference in the Mercantile Marine

The causes and nature of the interference to which wireless communication in the mercantile marine is subjected are examined in the paper by Commander J. A. Slee, which was read before the Wireless Section of the INSTITUTION OF ELECTRICAL ENGINEERS in London on May 2nd. The power radiated by ships is of the order of watts compared with kilowatts used by land stations, and the paper records the steps that have recently been taken to analyse the types of interference caused by the stronger broadcasting and other emissions with ships' signals, the degrees of freedom to be expected in the various marine services being indicated.

The Benevolent Association

LORD MESTON presided on Friday last at the annual general meeting of the Electrical Industries Benevolent Association, held at the Café Royal, London. The report of the Council for the year ended December, 1933, read by the secretary, Captain J. T. Keeping, showed that the income from contributions was £3,522 and the total, after adding interest on investments, £5,699. Grants made numbered 359 and totalled £2,353. Six pensions cost £211; the total expenditure on relief was £2,564. It was hoped that the invested funds would continue to increase so that pension activities might be extended.

Mention was made of special collecting work done by various bodies and centres; of the valuable aid given by the 400 Fletcher collecting plates with which most of us are now so familiar, and of an increase of 412 in the associate membership, largely due to the help of certain employers in bringing the Fund before their employés.

After the report and accounts had been adopted it was resolved to appoint Mr. Justus Eck as honorary secretary and Mr. J. Y. Fletcher as honorary treasurer as a mark of appreciation of the valuable work contributed by them to the organisation. The following re-elections and new elections to the Council were approved: Lord Meston, Lady Moir, Miss Haslett, Sir A. Y. Spearman, Bt., Messrs. R. W. Hughman, E. E. Sharp, J. N. Stephens, A. S. Markes, H. A. Lingard, J. W. Simpson, and H. Meysey Thompson.

Mr. Eck brought forward a proposal for a substantial increase in the number of members of Council, and Mr. R. P. Sloan supported the idea. As no opinion to the contrary was expressed the matter will form the subject of a special resolution at a later meeting.

At the luncheon, Mr. P. V. Hunter alluded to the great value of the voluntary work carried out by the committees, and made special mention of the zeal of Mr. E. E. Sharp and his executive committee. The local centres were a source of great strength and they deserved high commendation. He said that critics thought that there was too great a tendency to accumulate funds for the future rather than to deal with present-day needs. He felt, however, that present necessities were reasonably relieved while the position for the future was being strengthened. Lord Meston, he mentioned, had not been a figure-head, but a man of extraordinary activity, whose visits to the local branches had been greatly appreciated.

Lord Meston, in replying to Mr. Hunter's "cordial benediction," said that during the year no single deserving case of appeal for assistance had been rejected, and they had also strengthened the funds by £1,400. As years passed by cases would become more numerous, and the future must, therefore, be in the minds of prudent administrators. Personally, he considered that he had been merely a stop-gap between that human dynamo, Mr. R. P. Sloan, his predecessor, and Lord Ashfield, who would follow as the new president. Lord Meston added a word of thanks to the Executive Committee, to Mr. Sharp, Mr. Eck, to the E.A.W. led by Miss Haslett, and to the permanent secretary, Capt. Keeping. He read a letter received from Lord Ashfield, who was absent through illness, regarding the work of the Association. This is referred to in our "leader" pages.

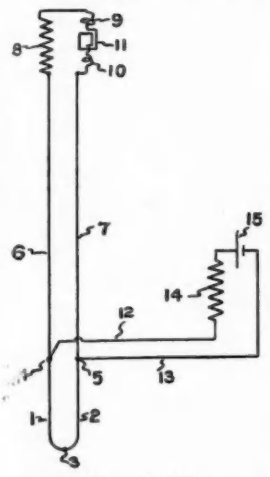
Correspondence

Correspondents should forward their communications as early as possible. No letter can be published unless we have the writer's name and address in our possession

Protective Relay for Thermo-electric Devices

I have noted with interest the device by W. Geyger described in your issue of April 20th (p. 573), but it seems to me that the inventor has gone a very long way round to achieve what can be done in a much simpler way. In my "broken couple alarm," covered by patent No. 261116, I apply to the thermo-couple circuit a very small e.m.f. in such a way that there is a small but constant addition or subtraction to the deflection of the indicator pointer, and this small deflection is taken into account in the zero setting.

While the thermo-couple remains intact, the apparatus operates entirely in a normal manner, but if the thermo-couple breaks (as is inevitable sooner or later in the case of high temperature measurement) the resulting current through the indicator, from my superposed circuit, is then sufficient to take the pointer right down below zero or right up above the top of the scale, whichever may be the more convenient, and in that position the apparatus operates to sound an alarm and/or cut off the heating from the furnace.



In the accompanying diagram the thermo-couple wires are 2 and 12 with their hot junction at 3 and their head connections at 4 and 5. The circuit consisting of cable 6, 7, ballast resistance 8, control springs 9 and 10, and moving coil 11 is normal to a thermo-couple indicating or recording pyrometer. The superimposed circuit is brought on at the head of the thermo-couple by leads 12 and 13, the source of e.m.f. being an accumulator, dry battery, step-down transformer and rectifier, or other convenient method with a very high series resistance 14.

The resistance of the thermo-couple circuit 4, 12, 3, 2 and 5 is extremely small compared with the remainder of the thermo-couple circuit 6, 8, 9, 11, 10 and 7, thus the major part of the very small superposed current passes round the thermo-couple and only an almost negligible fraction through the alternative or parallel circuit, but when the thermo-couple breaks the whole effect of the superposed current must pass through the indicator whose resistance, though high, is yet small compared with the series resistance 14. Thus quite a large deflection is produced in the indicator on the breaking of the thermo-couple.

CHARLES E. FOSTER,
Letchworth, *April 25th*. (Foster Instrument Co.)

Incentives to Salesmanship

I thought the article bearing this title a splendid one. To me, however, the great difficulty seems to lie in inducing managers of supply authorities to adopt such methods. From my experience I see no immediate desire on the part of many supply undertakings to tackle sales problems in a businesslike way. Municipalities, more than companies, seem over-anxious to erect ambitious palaces of shining light, calling them showrooms, stock them and leave it at that, seemingly forgetful that the prime purpose should be to sell.

I have often considered that some compulsion should be introduced to ensure that the sales side of an undertaking should be administered and controlled by men who understand economics, psychology and general commercial practice. At the present time the sales side seems to be "nobody's baby." After all, mains engineers, station engineers, and even clerical staffs have their principles, regulations and forms laid down for them as well as associations to protect their interests. Is it not time something was done in the interests of the sales staffs of supply authorities?

The faults lie with managers and executives who, as Mr. Plucknett points out, do not appreciate personal effort, while there is also a lack of co-operation in other sections of the department which all tends to damp the ardour of any man, not only the salesman.

The supply industry is shackled with too many old men as managers who invariably possess old ideas. They are content to sit tight, knowing that they are reaching a pensionable age, and are loath to disturb a peacefulness that has taken years to evolve, as the alternative to "chancing their arms" with something new.

E.D.A. has a lot of responsibilities awaiting it, and one of them should be to investigate and examine the methods and results of every supply authority, to find whether correct and modern methods are being used to get the best out of its undertaking. The problem could be tackled by regional investigation committees set up by legislation. This should have the right effect if strict measures were put into operation as a result of the committees' findings. If E.D.A. considered this idea too revolutionary perhaps it could provide a scheme to employ the aged "chiefs" so that they could be replaced and their positions in industry filled by more enterprising individuals for whom there is a great and immediate need. C.

April 27th.

A view of the electricity works at Burford (Oxon) after they had been gutted by a fire which broke out during last week

Contractors and Supply Authorities

As a registered contractor I venture to reply to your correspondent "A Sufferer," and would give the following answers to the questions raised: (1) The E.C.A. or National Register do not give any support beyond taking subscriptions with thanks. (2) There are between fifty and sixty contracting supply companies on the roll of the National Register (why, I cannot understand). (3) I can mention several contracting supply companies and corporations in London alone that certainly do not worry about the N.R. inspector.

Two of the largest supply companies in the London district (not members of the National Register) go all out for contracting work and seem proud of the fact, for they exhibit their signboards on every job they do. Heaven help the unfortunate contractor who happens to get a job in their areas. They put every obstacle in his way, and if they can get hold of the client before it is too late will quote him a cut-throat price to obtain the job, and will even go so far as to persuade the client that only they are capable of carrying out the work. Of course, the client naturally thinks that if the supply company does the work it must be all right. I have inspected some of the work carried out by supply companies and should be ashamed to pass it. But then, what do they care? They

Lord Weymouth (next to bottom), who is now controlling Gough's Caves, Cheddar, superintending the installation of flood-lights in one of the caverns

can pass their own work, whether good or bad. No wonder the contractor is unable to find much work, when the supply companies are taking his living away.

This is where inspection by the National Register should come in. The National Register would be a fine institution were it not for the fact that it encourages supply companies to carry out contracting work. Why it does so I fail to see, because if it ropes in all the supply companies where will the contractor come in? I feel that the 1,600 or so registered contractors should have something to say about it.

As regards the E.C.A. : some time ago I contemplated joining, but when I perused the literature I was amazed to notice that Question 11 in the application form was "State your reason for joining the E.C.A." I should have thought it was the place of the Association to inform contractors why they should become members.

In my opinion, it is now the duty of the E.C.A. or the National Register to take up this matter on behalf of the contractor and put a stop to the growing menace of contracting supply companies and corporations. If these associations refuse their support is there not an influential gentleman connected with the contracting business who is willing to take up the challenge on behalf of the unfortunate contractors? I am certain he would have the backing of the majority of contractors in the country. A "REGISTERED" SUFFERER.

April 25th.

In his letter published in your issue of April 27th Mr. Sayers asks: "On what principle or by what title can electrical contractors claim a collective monopoly of installation work?" Well, do they? I have never heard them say so. What the general body of contractors desire is that a friendly feeling should exist between supply authorities and themselves, not one of animosity as seems now to be the case.

I quite agree that consumers' installations and supply authorities would be useless, one without the other, but it should be remembered that the contractor is the unpaid canvasser of supply authorities, and it is up to these authorities to get on with the supplying of current at a reasonable figure, instead of offering inducements in the way of fixing lighting and plug points, not to mention the hiring of irons, radiators, &c., at ridiculously low rentals, in order to induce people to buy their high-priced commodity. Anyone can get orders when he gives the goods away. Furthermore, the contractors have not an unlimited supply of capital in the shape of the ratepayers' money to spend on the erection of showrooms, &c., and the financing of all kinds of hire-purchase schemes.

I feel sure that a good many supply authorities' engineers who are at present contracting would be glad to dispose of this side of their undertaking but cannot, owing to the attitude of their governing body of gentlemen who are out for all they can get, so long as it does not hurt their private business. It is clear that the majority of the members of electricity committees, &c., are not in the electrical trade.

If the contractors had secured a charter many years ago and the supply authorities had more power to condemn bad workmanship, the electrical contracting industry would be in a very much better position to-day. Furthermore, why on corporation housing schemes cannot a good specification be drawn up to give old-established contractors a chance, instead of committees accepting ridiculous prices and then having to spend the difference on maintenance afterwards.

Stockport, *April 30th.* W. G. SHAW.

More Flex Wanted

I wish thoroughly to endorse what Mr. Onslow states in your issue of April 20th with regard to this matter. Having been a buyer for many years of large quantities of irons, kettles, toasters, etc., I know of the many complaints received from purchasers who find the usual petty allowance of 6 ft. of flex quite insufficient and a source of annoyance. The flex is discarded at once, and a longer piece is fitted to the apparatus entailing additional expense. This practice became so troublesome and annoying that some years ago orders were withheld until manufacturers agreed to fix free 9 ft. of flex on irons, kettles, etc., prior to dispatch from the factory.

For the past couple of years no orders have been given for this class of apparatus unless 9 ft. of three-core flex has been provided by the manufacturers before dispatch. This obviates a great deal of annoyance to users who have three-pin plugs in use. The best method to overcome the trouble is for buyers of large and small quantities to refuse to accept 6 ft.

It would be interesting to have the views of other buyers and of manufacturers with regard to this arbitrary and useless allowance, and also some remarks regarding failure of connectors (not sufficiently robust for the work for which they are intended) and the constant breakage of flex at the connector entry. BUYER.

April 25th.

Referring to Mr. D. V. Onslow's letter in your April 1st issue, I think that if his installation was designed properly he would not want more than 6 ft. of flex. After all, a radiator is only made portable from room to room and not about the room. It is not very artistic to have flex trailing all over the place, nor is a standard lamp the ideal way of lighting a dining table.

He stipulates three yards of flex, but a point that is more deserving of notice is that numbers of consumers have one plug, which serves the whole house, and in such cases they have five and six yards of flex on a radiator, making it possible for unenlightened users to carry unearthed appliances into bathrooms. I have been in numerous houses and found pear switches under the pillow. No wonder the first thing blamed for a fire is the electrical installation. F. CORTON.

Ilford, *April 26th.*

Main Switch Control

I should be interested to know whether your readers consider it contrary to the I.E.E. Regulations to install a d.p. switch with fuse on the live side only with a link for the neutral; if so, what possible advantage is to be gained by so doing?

Regulation 94 D emphatically states that the main control shall be fitted with at least the following switchgear: (a) a d.p. overload circuit breaker or a s.p. overload circuit breaker in one conductor, and a s.p. switch and fuse in the other conductor, or a d.p. linked switch with a fuse in each conductor. I am unaware of any amendment to this, nor have I ever come across a public supply company refusing to allow a d.p. switch and d.p. fuses to be installed until quite recently.

Surely such main switch control is bound to cause greater complications in the wiring installation, as one can hardly call s.p. distribution boards and a neutral bus bar a standard pattern. CHAS. E. GRAY, A.M.I.E.E.

Lowestoft, *April 28th.*

Electric lighting and heating in a modern dining-room designed by Messrs. Maurice Adams, Ltd.

Hot Water

One of the latest ideas in electric water heating is to do away with the usual immersion heater and instead insert one or more pieces of conducting metal insulated from the tank or kettle. If only one pole is used there can be an earth return in which case only one wire is necessary. As there is no element there is nothing to burn out—the current passing through the water, can be adjusted by the size of the insulated conductor and also by the distance between it and the return pole whether this is the tank or secand electrode. In the case of a kettle the conductor can be protected by a perforated cover—it appears shockproof and apparently has no effect on the water. We should like to know what arguments there are for or against this arrangement for a.c.

CUNNINGHAM, LTD.,
R. N. Cunningham,
Managing Director.

London, W.2, *May 1st.*

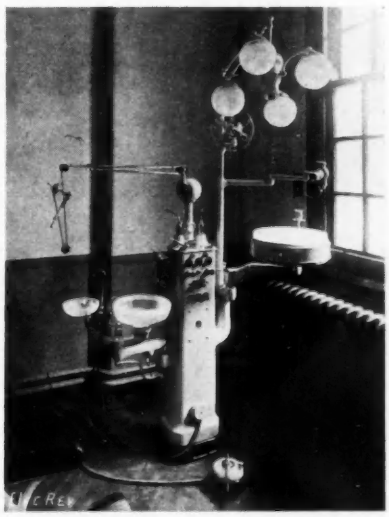
New Apparatus and Devices

for Domestic, Cooking and Heating, Lighting, Power and Scientific Purposes

An Electric Dental Unit

Installed at the Shenley Mental Hospital is an interesting dental unit which is completely electrically operated. It is made by the Dental Manufacturing Co., Ltd., Brock House, Great Portland Street, W.1, and the arrangement is such that every piece of apparatus comes readily to hand.

The head of the pedestal carries a four-speed electric engine, holders and heaters for the atomisers and tumbler, a hot-air syringe (6 V), an air cut-off and a 6-V pilot light. On its sides are arranged a spittoon bracket, a hot and cold water syringe, a bunsen burner, a bracket arm for the electrically equipped bracket table and a bracket which supports the operating light, the fan and the 12-V spotlight.



The electrically operated dental unit installed at the Shenley Mental Hospital

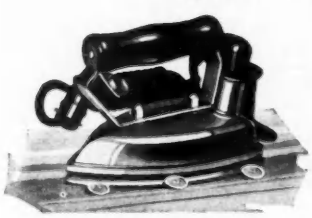
On the face of the pedestal are various switches and controls, and at the base is attached a connecting rose for the engine foot-controller cable. Housed within the pedestal are an air compressor, metal tubes for the coal-gas supply and water supply and waste, an electrical switchboard and transformer main switch and fuses or cut-outs, and the main water supply filter and non-return valve. Free access to these parts is provided by a full length door at the rear of the pedestal, which can be detached in a few seconds by the removal of its screws.

A Tiled Portable Fire

The "Mosaic Magnum" fire, a new product of Messrs. Girlings, Ltd., Electricity Works, Maldon, Essex, has on each side of the fire proper three removable tiles which can be obtained in various colours. Three types are available loaded at 2, 3 and 4 kW, and priced at 57s. 6d., 65s., and 84s. respectively. In all cases two switches and two yards of flex are fitted. The standard finish is a combination of matt and glossy black with chromium plating.

An Improved "B. & Y." Iron

A recently introduced improved type of iron which includes a button groove along the entire length of both sides of the iron is being marketed by Messrs. Berkeley & Young, Ltd., Tyseley, Birmingham, 11. The price remains as before—10s. 6d. nickel plated and 12s. 6d. chromium plated.



The new "B. & Y." iron

The "Humane" Electric Stunner

"Humane stunning," although not exactly new to this country, has only recently been made compulsory. The Humane Stunner Co., 73, Southampton Row, W.C.1, has produced a new British-made electrical stunner, complete with transformer, &c., priced at £13 10s. with one pair of tongs or £15 5s. with two pairs. These prices are for d.c.; for a.c. the cost is 10s. and 5s. extra respectively. The stunner is simple in construction, and it is made so that where it is necessary to slaughter animals suffering from swine fever, foot and mouth disease, or other contagious complaints, the apparatus can be quickly and easily dismantled and completely sterilised. The electrical unit is totally enclosed, being made to meet all conditions, including wet floors, &c., which exist in abattoirs, and conforms to Board of Trade requirements. The stunner is a pair of tongs made of two stainless steel tubes each of which passes without jointing of any sort through the central hinge, thus ensuring exceptional strength. The handles of the tongs are covered by suitable rubber grips to enable the operator to use them with complete comfort and safety and the switch is in such a position in relation to the hinge that it operates automatically when the tongs are opened or shut.

The tongs are arranged so as to adjust themselves to the animals and so as to ensure that the full area of the electrodes is in contact with the animal's skin. Another special feature is the incorporation of a drenching valve which releases the required amount of saline or brine just at the moment when contact takes place between the electrode and the animal, thus ensuring perfect conductivity.

Flock-spraying Equipment

For the application of flock (suéde finish) to small articles such as table lamps, &c., the Aerograph Co., Ltd., Lower Sydenham, S.E.26, has introduced a special spraying gun. The density of the flock is regulated by the valve at the top of the gun, and the action of the gun is controlled by pressing or releasing the button mounted in front of the handle. The pressure is adjusted at the air transformer, the usual operating pressure being from 5 to 15 lb. per sq. in.

The "Aerograph" flock-spraying gun

The container, which has a capacity of one quart, can be detached rapidly, making the gun particularly suitable where frequent colour changes have to be made. Where no means of controlling the air pressure is available the "De Vilbiss" gun is available incorporating three adjusting valves. It is recommended that the flock should always be sprayed in an "Aerograph" flock reclaiming booth. This booth contains an electric suction fan which draws all surplus flock into a reclaiming bag, thus eliminating waste.

The "No-Mast" Aerial

A wireless aerial is not necessarily an eyesore, but it usually is. Modern wireless sets will work quite satisfactorily without the highly efficient aerials which were imperative in the days of crystal sets and low-power transmitters. The new "No-Mast" aerial, marketed by Central Equipment, Ltd., 188, London Road, Liverpool, provides a neat, yet efficient, outdoor aerial costing 10s. 6d. with all fittings, and can be erected in twenty minutes.

Reception is obtained from a bunch of antennæ which is fitted as high up on the house as possible, and 50 ft. of lead-in. To obtain the best results the lead-in should not be cut to the required length but should be coiled loosely round the lead-in bracket. The damping effect of this aerial is very low, and it therefore gives good selectivity.

A Two-heat Coffee Percolator

A feature of the "Thermex" coffee "brewer" which is being sold by Rotapex, Ltd., 61, Berners Street, W.1, is the provision of means for cutting down the heat when the water has boiled so that the coffee can be kept hot. The annealed glass container holds forty-one liquid ounces, which is adequate for the average family. The price is 37s. 6d. Two larger sizes (51 and 64 liquid ounces respectively) are also available at 42s. 6d. and 47s. 6d.

A New Radio Condenser

The latest addition to the range of products of the Dubilier Condenser Co., (1925), Ltd., Victoria Rd., North Acton, W.3, is a new dry electrolytic condenser which is intended for the use of radio set manufacturers. It is known as type 3012, the sample illustrated having a capacity of 25 μF, and is suitable for a peak working d.c. voltage of 25 V. It is cylindrical in shape, 2 in. long and $\frac{3}{4}$ in. in diameter, with a pierced connection tag at each end, polarity being indicated by colouring the ends red and black.

The Dubilier "3012" condenser

A Home Disc Recorder

Very little skill is needed to operate the gramophone disc recorder which the Ronnie Engineering Co., Crewdson Road, S.W.9, has designed for use in the home.

A demonstration last week showed how easy it is to use the outfit, which includes a not too sensitive moving-coil type microphone in which is incorporated a small pilot lamp to indicate when recording commences and also to provide a warning of the approaching end of the record.

The 5-W amplifier is controlled in a very simple manner, the appropriate value being obtained merely by rotating a pointer on a scale calibrated in feet to correspond with the distance separating the microphone from the speaker or musi-

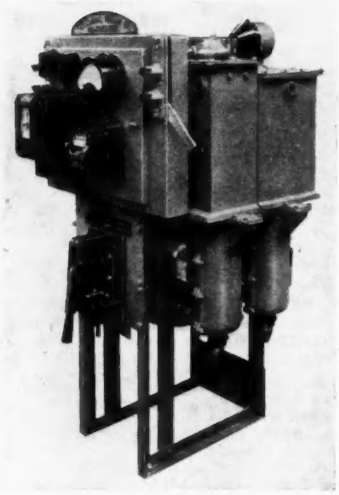
D

cal instrument being recorded. A 1/20 h.p. a.c. constant-speed motor drives, through appropriate speed-reducing gears, both the turn table and the recording head, which is of the energised type with unusually large electro-magnets. It is arranged for parallel tracking and to take care of irregularities in the surface of the record disc, having also a quick slide-back motion at the end of the traverse.

The records can be played-back immediately after completion, the total elimination of intermediate processing being a great advantage. The record is permanent, not easily damaged, and the volume obtained is ample for reproduction on any type of inexpensive mechanical gramophone without electrical amplification. Contrary to expectation, since alloy metal discs are employed, the results obtainable are good. The blank discs are quite cheap to buy and it is hoped to market the complete outfit at an early date at a price of about £25.

A Single-phase Ring-main Switch

Metalclad switchgear newly developed by FERGUSON, PAILIN, LTD., Higher Openshaw, Manchester, 11, for tapping single-phase e.h.v. ring mains, follows the general principle of the type "VSB" compound- and oil-filled units employing vertically isolated oil circuit-breakers. A type "BRS" single-phase breaker is arranged in conjunction with two sets of single-phase ring-main isolators equipped with cable sealing boxes and cable testing facilities. The single-pole round tank breaker is provided with terminals which form self-aligning socket members of the main isolating plugs. It is normally bolted up in position, but its small compact form enables it to be removed and handled conveniently and quickly by hand without the use of additional or complicated appliances. The ring-main isolators are lever operated, and have three definite positions, "on," "off," and "earth"; the operating handle of the isolator can be locked in any one of the three positions. A hinged padlocked cover on the isolating switch chamber provides access to the cable testing socket.

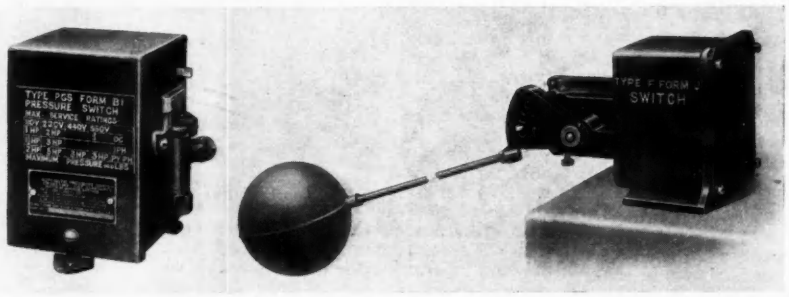


The new Ferguson, Pailin ring-main switch

In the unit shown, one of two current transformers is housed in the main phase conductor to operate the overload protection gear; while the second, of the air insulated type, is mounted externally in the neutral connection for metering purposes and is arranged with a short-circuiting switch so that the transformer can be conveniently removed and replaced to cater for alteration in the loading of the panel. An external removable link is provided in the neutral connection.

A single-phase breaker should have adequate "making" as well as "breaking" capacity, *i.e.*, it should be capable of closing against the peak value of a fully asymmetrical short-circuit current. The breaker illustrated has a rupturing capacity of 50,000 kVA at 2,200 V, but with suitable modifications, including the incorporation of rose and candlestick type arcing contacts, a rupturing capacity of 75,000 kVA can be provided. Oil breakers of similar design, but with slightly larger overall dimensions, are available up to 150,000 kVA single-phase rupturing capacity at 2,200 V.

The ring-main metalclad unit is almost entirely fabricated in construction, and instruments are mounted at a convenient height on a hinged panel which provides access to small wiring. All main phase connections are enclosed in a metalclad oil-filled chamber, the overall dimensions being 3 ft. 5½ in. wide, 3 ft. 6 in. deep, and 5 ft. 3 in. high.

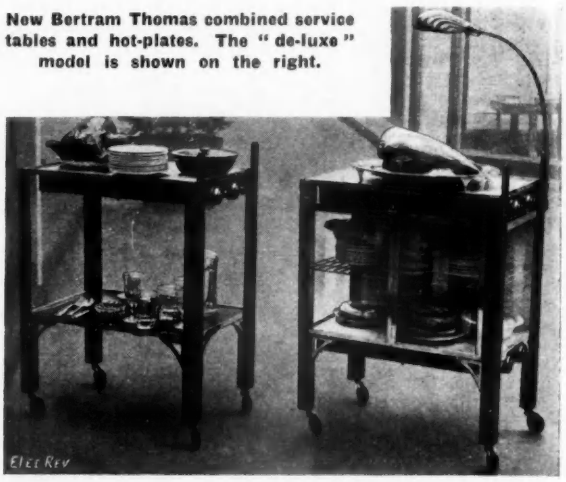


Typical examples of the new B.T.-H. automatic pressure switches and float switches

Heated Electric Service Tables

Newcomers to the domestic field are MESSRS. BERTRAM THOMAS, Worsley Street, Hulme, Manchester, who are marketing two unusual service tables. One model, priced at £6 16s., has for the top shelf an aluminium frame supporting a combined aluminium shelf and hot-plate. This hot-plate works at a comparatively low temperature and is loaded at 400 W, and is intended for use as a carving table as well as for keeping food warm for late comers to a meal.

New Bertram Thomas combined service tables and hot-plates. The "de-luxe" model is shown on the right.



A "de-luxe" model costing 12 gns. has the lower shelf also in the form of a hot-plate, and the lower section between the two hot-plates is enclosed to form a warming cupboard which is fitted with glass sides and hinged glazed doors. In both cases additional plugs are provided enabling toasters, coffee pots, kettles, &c., to be heated on the trolley. The lamp which is shown in the photograph can be obtained for 25s. extra and greatly facilitates carving when the table is used in a dark corner of a room.

The "Lumiflex" Link System of Lighting

A new method of supplying the "Lumiflex" link system of lighting has been adopted by the DOMINION ELECTRICAL COMPANY, 31, Windmill Street, Tottenham Court Road, W.1. "Lumiflex" is now fitted to hardwood battens and supplied in any length. It is only necessary, therefore, for the consumer to state the area to be illuminated, and the necessary quantity of battening is despatched all ready for erection in the required position. The only alteration to the interchangeable sign letters this season is the employment of stainless-steel reflectors in place of the chromium-plated ones used last year.

Motor Control

Recent additions to the line of control devices manufactured by the BRITISH THOMSON-HOUSTON CO., LTD., Rugby, are the type PGS automatic pressure switches and the type J float switches.

The new automatic pressure switches are of diaphragm pattern, designed to operate upon changes of pressure of air or any liquid which will not affect rubber or steel parts. The switches themselves are double-pole with silver contacts having two breaks per pole. They can be used for direct starting small motors or as a pilot device for operating contactor starters of large motors. Typical applications are garage compressors, domestic and car-cleaning water pumps, priming and grease pumps, "stop" lights on cars, and traction air- or vacuum-brake equipments.

For pressures up to 250 lb. an unloader can be fitted which automatically reduces the pressure in the air-compressor cylinder to atmospheric as soon as the switch has opened the circuit of the driving motor. This ensures that when the pressure switch next operates to close the circuit the motor starts against reduced load. An electrical device can also be fitted for operating the unloader should the supply be interrupted.

The new float switches, which are similar in contact construction to the automatic pressure switches, can be supplied in two forms, either for direct operation, as illustrated, or for chain operation. Their chief field is for controlling motor-driven pumps when it is desired to maintain a predetermined level of water in a tank, or for limiting the travel of the ram of a hydraulic accumulator. They can be used for the direct starting of small a.c. or d.c. motors or as pilot switches for the operation of contactor starters for larger sizes of motors.

Notes from Canada.

BY OUR SPECIAL CORRESPONDENT

A better outlook

ELECTRICALLY speaking, there has not been very much to record in Canada in recent months. Trade appears to be definitely, though slowly, improving; traffic on the railways is increasing, more people are finding employment, and electrical loads are growing. The output of the central stations has been increasing steadily, and although a considerable proportion of the increase, especially in Ontario, has been due to the installation of some very large electric steam boilers in paper mills, it can be shown that even subtracting the energy taken by these there was an appreciable increase in the output (some 14 per cent.) in 1933 as compared with 1932.

In Ontario, a province practically without coal, the utilisation of hydro-electric energy for steam generation reduces the amount of (bituminous) coal imported from the United States. For example, at Port Arthur, which is at the far end of Lake Superior, about 800 miles or so from Toronto, but still in Ontario, the Hydro-Electric Power Commission of Ontario has recently contracted to supply current to steam boilers in a paper mill to an extent that will save the importation of about 30,000 tons of coal per annum. Power at a very low rate per kWh is used and it is understood that the contract can be terminated by the Commission at short notice when more profitable outlets for power develop as trade improves.

The province of Quebec has always been a stronghold of private ownership of electrical undertakings in contrast to Ontario, where public ownership is favoured, yet in the former a Bill has recently been introduced into the provincial House which, if passed, will enable any municipality in Quebec to arrange for a publicly owned electricity undertaking which would be under the control of a special corporation to be created by the municipality. Whether any considerable number of municipalities will take advantage of these new powers remains to be seen.

Water Power—Developed and Available

Canada's developed water-power capacity continues to increase, although not at such rapid rate as it did a few years ago—at the end of 1933 it was about 285,000 h.p. more than at the end of 1932, the total being just over seven million h.p., which is about one-sixth of the total available. The water-powers still undeveloped are, naturally, those which lie remote from the centres of population, except some like the four million h.p. available on the St. Lawrence river, three million h.p. of which belongs to Canada.

The great mining districts of the Dominion have been responsible for several water-power developments of considerable size in regions where, lacking such mineral wealth, no such works could have been undertaken. Two mines, in what is known as the Patricia district of Ontario, in the north-western part of the province, are to be served from a new hydro-electric development which will be constructed shortly by the Hydro-Electric Power Commission, on the great Albany River which flows in a north-easterly direction and drains into James Bay, which is a southerly arm of Hudson Bay. Apart from the mines, there is nothing within many hundreds of miles of the site which would warrant any such development.

As recorded in these notes last year, an agreement for the canalisation of the international section of the St. Lawrence River and the development of two million h.p. in that section was signed by representatives of the Canadian and United States Governments, but before it became effective it had to be ratified by each Government. Canada awaited United States action but the Government of that country has recently refused to ratify the treaty. It is said that President Roosevelt intends to bring the matter up again at Washington in a few months' time, but what will be its fate then it is impossible to predict. The President is apparently very strongly in favour of the treaty, but there are so many conflicting interests involved that so far it has been impossible to reconcile them to the extent of securing the necessary two-thirds majority vote.

The Domestic Load

Hard times in the electricity supply industry have acted as a spur to the authorities concerned in the selling of off-peak and surplus power, especially for domestic purposes, as the domestic load is now recognised as being one of the most stable loads. Campaigns to greatly extend the use of domestic electric water-heaters and electric ranges (cookers) have been, and will be, undertaken in Canada as elsewhere.

Soil heating is also being taken up actively; a good deal of work has already been done in the province of Quebec, and in Ontario a specially low rate per kWh has recently been established for the purpose by the Hydro-Electric Power Commission. This takes the form of a third rate for rural consumers and is 0.75 cent per kWh with a discount. If a consumer cares to install a time-switch which will keep his soil heating load off the local peak, he will get a discount of 33⅓ per cent.; this third rate has been established after experience with a number of existing installations. The Commission is now supplying, in 170 so-called Rural Power Districts, about 62,000 rural consumers living in 352 townships and ninety-two villages fed by rural primary lines exceeding 9,000 miles in length. In 1924 the rural load was 4,000 h.p., to-day it is more than 22,000 h.p.

It seems rather late, and perhaps almost too early, to mention the Canadian National Exhibition because we are just about half-way between one Exhibition and the next. At the same time if any British electrical firms wish to exhibit their products this year it is hardly too soon to be thinking about it. The British electrical industry has never been at all adequately represented at this annual exhibition, although many other British industries regularly participate, and some of these are putting on larger and better exhibits every year.

The Jordan River plant of the B.C. Electric Co.

Last year, with the exception of stalls held by one or two agents representing a few lines of British electrical products in a relatively small way, I did not see a single British exhibit from overseas—even the firms which have established important branches or subsidiary Canadian companies and have exhibited regularly for some years past were not at their accustomed stands last year. On the other hand Canadian electrical firms, many of them subsidiaries of United States companies, were almost as well represented as usual.

An Appeal to British Manufacturers

Canada, in many ways one of the most important of the British Dominions, and by far the nearest to the home country (*pace* the Irish Free State) seems to be in danger of being abandoned as a market for British electrical goods. Can no concerted effort be made to offset the apparently almost overwhelming influence of the United States?

It is well known, of course, that Canada manufactures no small quantity of electrical goods which serve her own home market and even furnish exports as well, but the value of imports from the United States is still very large, at least in normal times. It has always seemed to me that some worthwhile proportion of this trade might be diverted to Great Britain if the matter were handled in a large way and with some aggression.

Cannot British manufacturers make some showing at the next Canadian National Exhibition, so that Canada may learn that there are British manufacturers of electrical equipment, or is *finis* to be written across the historical record of the Canadian electrical market so far as Great Britain is concerned?

Electricity on Warwickshire Farms

Nearly all the villages in Warwickshire, however remote, are now connected to electric mains, and the use of electricity on farms is rapidly increasing. The City of Birmingham Electric Supply Department alone supplies over 100 farms in Warwickshire not only with light, but with power for the heating of incubators, electrical milking machines, and for stationary machinery which was formerly driven by oil engines, &c. In the Vale of Evesham experiments are being carried out with the heating of the soil by electricity, with a view to forcing earlier crops of fruit and vegetables.

In the Courts

IN the King's Bench Division on April 25th Mr. Justice Horridge heard an action brought by the Battersea Corporation against United Stone Firms (1926), Ltd., to recover damages for alleged breach of contract in connection with the supply of electricity to the defendants' works.

The plaintiffs stated that by an agreement dated November 27th, 1929, the defendants undertook to take a supply of electricity at the standard price for a period of ten years. The plaintiffs were to lay the necessary mains and the defendants agreed to pay for a minimum annual consumption of 100,000 kWh of *alternating* current. On July 24th, 1931, a receiver and manager was appointed by the debenture holders of the defendant company. The supply was continued and eventually the works were sold.

The plaintiffs alleged that in these circumstances the defendants had failed to accept and pay for the agreed amount of electricity with the result that they (the plaintiffs) had lost a profit of £1,617.

The defendants maintained that the minimum annual consumption of 100,000 kWh applied to all electricity whether alternating or direct current. Up to the time at which they had sold the works they had taken and paid for the minimum amount and they contended that on the true construction of the agreement the guarantee was given by the defendants that the minimum consumption would be taken at the works by any persons who might be the owners or occupiers of the premises during the ten-year period. They alleged that they were entitled to a set-off of £110, which was paid to the plaintiffs on November 7th, 1930, and also that they were entitled, for the purpose of seeing whether the guarantee had been complied with, to credit for all electricity supplied during the ten years, whether a.c. or d.c., and whether supplied during the occupation of the defendants or their successors in title. Further, they submitted that the plaintiffs were not entitled to damages in anticipation of the failure of defendants' successors to accept and pay for the minimum amount.

Mr. F. A. Bond, the borough electrical engineer, gave evidence for the plaintiffs, and in the result his Lordship ruled that the obligation on the defendants by the agreement was to take a minimum annual consumption of 100,000 kWh of *alternating* current, and after Counsel had consulted together as to the sums to be credited to the defendants, judgment was entered for the plaintiffs for £1,000 agreed damages with costs.

The Poplar Coal Contracts

At the Westminster Police Court on April 26th Mr. William McElroy, coal contractor, appeared to answer two summonses alleging that he had obtained sums of £1,151 and £1,373 from the Poplar Borough Council in connection with the supply of coal to the Electricity Department, which, it was said, was of a cheaper quality than that which he tendered to supply. It was stated that the case arose out of the special audit, details of which were given in our issue of March 23rd (page 423).

Mr. Gerald Dodson appeared for the Public Prosecutor and Mr. Ray Whiteway for the defence. Outlining the case, Mr. Dodson said that in January of each year specifications were sent out to various contractors, accused being one of them, asking or inviting tenders for coal for the electricity undertaking. In January, 1931, a tender and specification were sent to the accused for the supply of Durham peas. In a tender returned on February 6th, 1931, signed by defendant's son, Mr. W. E. McElroy, it was stated that the collieries from which the coal to be supplied came were Pease's and Pelaw Main, both Durham collieries. He was given a contract to supply up to 12,000 tons of that coal, and in fact he supplied 12,985 tons, receiving cheques during the year amounting to £15,137. What, in fact, he did supply was not Durham coal at all, but Northumberland coal. The figure varied a little, but the magistrate might take it that by supplying Northumberland coal and pretending it was Durham coal he would get at least 5s. a ton more, and the total difference amounted to £3,246.

The same thing happened in the next year. McElroy supplied 9,250 tons for which he received a total amount of £10,444, and again taking the difference in value between the Durham coal and the Northumberland coal at 5s. a ton it meant that the Council lost £2,312, making the total for the two years £5,558. There were several reasons why this matter was not discovered at the time, and there was one which in fairness to the accused might be made public then. The coal he had supplied answered the purpose perfectly well, and therefore the men handling the coal to generate the power had no reason to question it in any way. The point was, however, that if the Council had wanted Northumberland coal it could have got it in the open market at 5s. less per ton.

When Mr. Sidney Clermont, assistant electricity accountant to the Poplar Council, was being cross examined by Mr. Whiteway he admitted that in the tender for 1932 signed by Mr. William McElroy, specifying the colliery from which the coal was to come the words " Pease's or Pelaw main and/or equal quality to suit your requirements " appeared.

The Magistrate remarked that that did not bind the Council to use Durham coals.

Mr. Whiteway said that the defendant was a man of business repute, and he wanted to take an early opportunity of saying that his client would strongly oppose the allegations.

The Magistrate adjourned the case until to-day (Friday).

Parliamentary News (BY OUR SPECIAL REPORTER)

THE Middlesex County Council Bill was first in the list of Bills referred for consideration on April 24th to a Select Committee of the House of Lords presided over by Lord Askwith. Included in the Bill are clauses to confer on local authorities in the county who are authorised to supply electricity powers for the construction of electrical sub-stations under streets, for laying electric lines in private streets, further powers of entry for the enforcement of Acts and Orders, power to make contracts for the supply of electricity in bulk, to cut off supplies where charges are not paid and recover costs, and to confer on the County Council power to apply for a revision of prices charged by any local authority, company or person for the supply of electricity in the county.

Mr. Tyldesley Jones, K.C., who had been instructed by the County Council, informed the committee that although there were originally sixteen petitions against the Bill all the matters dealt with in the petitions had been settled. The Bill was thereupon remitted to the Committee on Unopposed Bills.

Battersea Power Station

On April 25th Mr. Todd asked the Minister of Transport whether he was satisfied that the pledge given by the Government on September 26th, 1929, to the representatives of the Chelsea Borough Council with reference to the emission of sulphur fumes from the Battersea power station had been fulfilled; and if he would make a statement as to the question of emission of smoke and fumes from the power station.

Mr. Stanley said that the pledge referred to still held and the remaining sections of the new Battersea power station would not be sanctioned unless the gas-washing plant already installed was working efficiently. The position at present was that while there was no reason to be dissatisfied with the results so far obtained, the station had not yet been in commercial operation sufficiently long for a final conclusion to be reached.

The Duty on Arc Lamp Carbons

On April 26th, during the report stage of the Budget resolutions, Sir P. Harris moved to reduce the proposed new duty on arc-lamp carbons from 5s. to 1s. 1d. He said that for thirteen years the arc-lamp carbon industry had had protection. The duty as originally imposed was less than 33⅓ per cent., while the new duty, imposed on a basis of weight, would amount to something like 70 per cent. on the higher grades and 120 per cent. on the cheaper grades. This was not a case of dumping or price-cutting, for during the last thirteen years the foreign article had been more expensive than the home-produced article. These electric carbons had become an article of general commercial use. They were essential in the cinema trade, and one of the reasons for the remarkable progress of the cinema in recent years had been the progress made in the manufacture of these carbons. He was told that the association representing the cinema industry had agreed to this tax, but he was also assured that it did not by any means represent the majority of the interests concerned. This new duty, which was being imposed by a Budget resolution, would affect thousands of people throughout the country. He was assured that the new duty would impose a tax on the ordinary large cinema theatre of something like £10 a week. Hospitals, too, would be seriously prejudiced.

Sir Robert Hamilton, who seconded, said that no question of revenue came into it. The result of the imposition of the tax was simply the equivalent of a complete embargo.

Dr. Burgin, who replied for the Government, said that the duty of 1s. was put on in 1921. The purpose of the tax was to help the local industry and, to some extent, to keep out the foreign goods. In 1926 it was reported by a departmental committee that the *ad valorem* duty had proved ineffective as a protection to the home industry. The question of national defence entered into this matter, for these carbons were necessary for searchlights and for certain other purposes connected with defence, and it was therefore essential that there should be a local arc-lamp carbon manufacture. The cinematograph industry had entered into a formal agreement with manufacturers of British carbons to the entire satisfaction of the cinematograph industry. The reason for entering into that agreement was that that big industry in this country was beginning to be seriously alarmed lest it might find itself entirely in the hands of Continental manufacturers of arc-lamp carbons. The consumption of arc-lamp carbons was such that there was no room in a market for more than a few manufacturers. The information at the disposal of the Government was that there was no purpose for which the British-made carbon was inferior to the foreign-made article.

An undertaking would be given that the price of British arc-lamp carbons would not be raised.

In the debate which followed, Sir S. Cripps, from the Labour benches, said that the present Government believed in the confiscation of property without compensation. The sudden imposition of this meant that the importers would find that their business no longer existed, and that their profits would

in future be transferred to a single British company. What urgency was there which justified this new taxation being put on without any previous inquiry?

Mr. Chamberlain, Chancellor of the Exchequer, said that between now and when the Finance Bill came before the House it would be possible for persons, firms, and institutions to make representations to the Board of Trade, and he was certain that the President of the Board of Trade would weigh up the importance of any fresh considerations. Duties were originally placed on these carbons because this was considered a key industry, and they were imposed for reasons of national interest connected with the defence of the country. That was the major reason which had influenced the Government. It was impossible to protect adequately the key industry side without affecting to some extent the other productions in which they were used commercially. Nevertheless, in this particular case a good deal of trouble had been taken to make sure that those interests should not suffer. Joint application had been made not only by the manufacturers, but also by the principal users of these carbons for commercial purposes, namely, the Cinematograph Exhibitors' Association. He was prepared to admit that there might be some temporary inconvenience in certain particular lines of these carbons when it was more difficult to get them from abroad, but he was sure it would pass away and that presently the consumers of carbons in this country would get just as good products from British manufacturers, in every line, as they could get from abroad.

The amendment was negatived and the resolution imposing the duty was carried.

The Electricity (Supply) Bill

This Bill, which confers further powers on the Central Electricity Board, was considered by the House of Lords, as a Committee, on April 30th. An amendment, moved by Lord Gainford, providing that arrangements made by the Board with authorised undertakers to supply electricity at a price lower than that fixed by the Act of 1926 should not be approved until other interested authorised undertakers had been given an opportunity of being heard, was withdrawn.

Approval was given to an amendment of similar character moved by Lord Eltisley. This was to the effect that arrangements under Clause 1 should not have effect until they had been approved by the Electricity Commissioners.

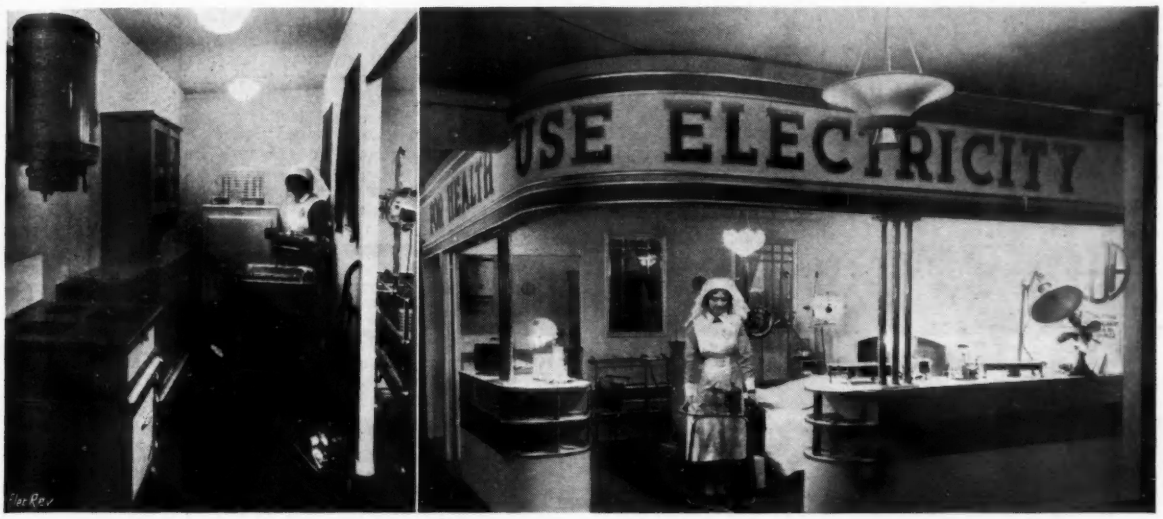
Viscount Elibank withdrew an amendment which sought to give authorised undertakings the right of being heard by the Commissioners with regard to proposed arrangements.

Upon consideration of Clause 4, which enables the Board to supply electricity directly to a railway company, Viscount Elibank moved an amendment to the effect that the Electricity Commissioners might make a Special Order permitting the Board to supply a railway company directly if they thought it expedient. This was supported by Lords Gainford and Askwith, but opposed by Viscount Knutsford, who said that it would retard railway electrification. The Earl of Plymouth, for the Government, said that he could not accept the amendment, which was withdrawn.

An amendment was moved by Lord Gainford providing that the Board should not incur a financial loss in supplying electricity to a railway company. This was agreed to.

The Earl of Plymouth said he was unable to accept an amendment put forward by Lord Middleton to extend the operation of the clause to dock, canal, and harbour undertakings, and it was withdrawn.

The Bill was reported to the House.



Two views of the E.D.A. stand at the Nursing and Hospitals Equipment Exhibition mentioned on page 640

Journalism and Industry

AT the luncheon of the Batti-Wallahs' Society at the Hotel Metropole, W.C.2, on April 26th, the new president, Mr. W. E. Highfield, received the badge of office from his predecessor, Mr. W. E. Lang. The principal guest was Mr. R. Child Bayley (managing director of the ELECTRICAL REVIEW, Ltd.), acting for Lord Iliffe, who at the last moment was called away to the funeral of an old employé of the firm. Mr. Child Bayley prefaced his remarks by distinguishing between "technical" and "trade" papers, the one being designed for the interchange of news and ideas among fellow craftsmen, the others dealing with business aspects, *i.e.*, the turning of those ideas into cash. He then dealt with three of the industries served by journals with which he was connected.

The development of the home motor industry was reflected in the reduction in the value of imported cars from £8,000,000 in 1925 to less than £300,000 in 1933, an excess of car imports over exports in the year of £370,000 having been turned into an excess of exports over imports of £11,000,000 in the same period. The Budget, by encouraging the production of cars of greater horse-power, would help the export trade. Of more particular electrical interest was his reference to the committee formed to consider what can be done to promote the use of electrically driven vehicles in this country.

Broadcasting was only started a dozen years ago, although the *Wireless World* was ten years older, and the slump had caught the infant radio industry at a moment when its rapid growth had outrun its strength. But it had weathered the storm, and its prospects were fair.

Passing from the newest to the oldest industry of all, agriculture, he pointed out that over 1¼ million persons were engaged in it in England and Wales, more than in any other single industry. To exceed this, shipping, iron and steel and engineering had all to be lumped together. The capital invested in the land was £1,150 million. Agriculture was passing through a remarkable stage. Recognising the importance of farming both from its value in providing customers for the urban manufacturers and from its social side in ensuring a virile race, "Marketing Boards" for milk, potatoes, pigs and hops had been formed, which had been given immense powers—more than any other public bodies, governments included, had ever received in this country. This experiment had yet to justify itself. While in its long past practice had out-run science, the present-day farmer was using science more and more in fertilisers, in nutrition and in genetics; while the car and the motor cycle were giving him the "machinery sense."

The consumption of electricity had taken the place of sulphuric acid, which was once described as the gauge of manufacturing prosperity. The electrical industry had roseate prospects, both near and distant. A near view showed that while the main arteries of distribution had been provided, many more capillaries would be needed, and the end of each of these capillaries must be furnished with appliances of every kind to utilise what they conveyed. Beyond this, there were great prospects before the industry as soon as international trade became free again, as in a civilised world it must. Looking still further ahead, one could visualise a time when as carriers of energy the coal train, the gas main and the petrol tank would be as obsolete as the tinder box and bow and arrow.

A vote of thanks to Mr. Child Bayley was moved by Sir Montague Hughman

Business and Industrial Notes

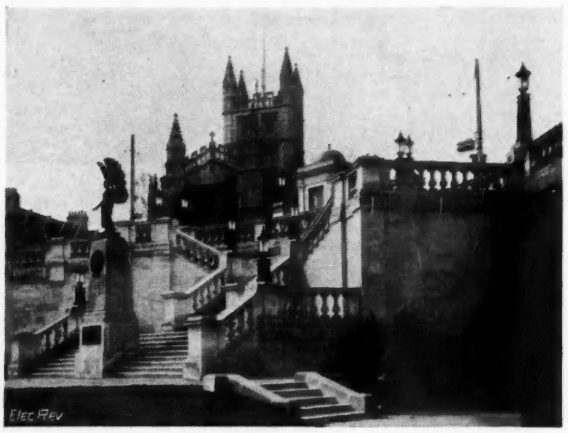
The Week's Electrical Trade News from all Sources. Commercial and Industrial Developments, Business Changes, Market Prices for Materials, Trade Openings, New Publicity Literature, Liquidations, and Failures

The Marking of Radio Apparatus

The Board of Trade gives notice that it has referred to the Standing Committee an application for an Order-in-Council to require the marking with an indication of origin of imported goods of the following descriptions: (1) Radio receiving sets, radio-gramophones, electrical gramophones, electrical audio-frequency amplifiers, whether imported complete or in parts; and (2) the following components and accessories for any of the goods included in 1: Battery eliminators; chokes; condensers; drives for variable condensers; electrical gramophone pick-ups; volume controls; electric gramophone motors; gramophone turntable units comprising an electric motor and a turntable; headphones; loud speakers; loud speaker units; resistances; valve holders and adaptors; transformers; tuning coils; resistance capacity coupling units; choke capacity coupling units; and chassis or frames carrying, or adapted to carry, a collection of components. Representatives of any interests substantially affected by the application who desire to be heard in opposition at the public inquiry which will be held later by the Committee should communicate with the Secretary, Mr. E. W. Reardon, at the Board of Trade offices, Great George Street, S.W.1, by May 26th.

Decorative Lighting Units at Bath

A number of G.E.C. decorative triple street-lighting units, with ornamental scroll work supports, of special design, have recently been supplied to the Bath Corporation for use in its new street scheme. The lanterns are of copper with diffusing glassware, and are fitted with "Wembley" prismatic refractors for light distribution. In addition, a large number of lattice newel columns supporting similar types of lanterns have also been installed in connection with the terrace walk improvement scheme. These handsome units, which are shown in the accompanying picture with Bath Abbey in the background, harmonise well with the adjacent surroundings. All these decorative lighting units are equipped with Osram lamps.



G.E.C. lighting units installed at the Terrace Walk, Bath

Notice to Advertisers

Attention is drawn to the announcement in our advertisement pages to-day regarding advertisement copy and blocks for our issues of May 25th and June 1st. These should reach our Advertisement Department not later than Monday, May 14th.

The Poplar Coal Contracts

At a meeting of the Poplar Borough Council on April 26th the General Purposes Committee reported having received a report from the Special Committee appointed to consider matters arising out of the interim report of the District Auditor upon matters relating to the Electricity Department, including coal contracts (*vide* ELECTRICAL REVIEW, March 23rd, page 423).

In this report it was stated that the Town Clerk had reported that as directed by the General Purposes Committee he had written to the Director of Public Prosecutions, stating that the Council had had the Auditor's report under consideration and that it was obvious that there were two portions of the report upon which the Council would have to take action, apart from the proceedings which it was understood were being taken by the Director; but that as the Council did not desire to do anything which would interfere with the action to be taken by the Director, he was asked how far, if at all, the Council's action ought to be limited at the present moment. The Director of Public Prosecutions replied stating that in his view it was very desirable that the Council should not take any action with regard to the Auditor's report until after the proceedings had reached a certain state. Counsel's advice is to be sought as to the action to be taken by the Council apart from that determined upon by the Director of Public Prosecutions. The Council approved the action of the Committee without comment. (A report of police court proceedings relating to the District Auditor's report appears on page 638.)

The Nursing and Hospitals Equipment Exhibition

There is an important electrical section at the Nursing and Hospitals Equipment Exhibition which is being held this week at the Ice Rink, Grosvenor House, Park Lane, W. The stand which will perhaps attract greatest attention is that of the E.D.A. This exhibit takes the form of a bedroom in which electrical domestic appliances and electro-medical apparatus used in connection with treatment for illness and convalescence are demonstrated. There is also a kitchen equipped with appropriate electrical apparatus. The appliances exhibited include a high-frequency set, an immersion heater, a bed warmer, a bronchitis kettle, bedside and inset fires, a "Sun-ray" lamp, a vacuum cleaner, an ultra-violet lamp, an electric blanket, an electric heating pad, and an electric mat. Electrical concerns who are taking part in the exhibition include the Medical Supply Association, Ltd.; Cox-Cavendish Electrical Co. (1924), Ltd.; the Thermal Syndicate, Ltd.; Messrs. James Ross & Co. (London), Ltd.; Electro-Medical Supplies; Stanley Cox, Ltd.; and Pentesales. Pictures of the E.D.A. stand appear on page 639.

A Travelling Exhibition

A show train equipped for demonstrations of electrical receivers and radio-gramophones marketed by the Gramophone

A London and Home Counties Campaign

PROPOSALS for engaging staff to conduct a development campaign were placed before the London and Home Counties Joint Electricity Authority at its meeting held on April 25th. This meeting was followed by the publication in the ELECTRICAL REVIEW of last Friday of an advertisement by the Authority inviting applications for temporary appointments as (a) special development assistants; (b) canvassers.

The Finance Committee suggested the institution of an intensive canvassing campaign amongst two-part tariff consumers in the Authority's area with a view to inducing such consumers to increase their consumption of electricity for purposes other than lighting. This suggestion was considered together with the following report and proposals prepared by the chairman:—

"I have been discussing with the chief engineer for some time what steps should be taken to increase the earning capacity of the new mains which have been laid by the Authority since taking over the various undertakings, and I have also taken the opportunity of discussing the position with all the district officers, and submit the following suggestions for the consideration of the Committee:—

"It is proposed that eight additional canvassers be engaged as follows: Twickenham 2, Surbiton 2, Esher 1, and Sutton 3. The canvassers will concentrate on the districts where mains are in existence and suitable to carry additional load without appreciable reinforcement. They will canvass not only for new consumers but also for additional load to be taken by existing consumers."

It was reported that extensions had taken place at such a rapid rate, particularly upon new estates, that it had not been possible, with the existing staff, to do more than merely connect up new consumers and leave them to find out the advantages and many uses of electricity in the home. The present rate of consumption was about 700 kWh per consumer, which was only one-half the rate of Wimbledon. If this could be improved by only a further 100 kWh per consumer it would mean at least another 7½ million kWh sold per annum. There was therefore great scope for improvement which could only be obtained by a careful concentration on the lines indicated.

It was also proposed that two development assistants should be appointed, whose particular work it would be to make contact with architects, builders, and others interested in building development, so as to secure their co-operation in adopting electricity to the fullest possible degree. These assistants should have a specialised knowledge of the general application of electricity in various classes of buildings. With such a large amount of building taking place in the districts covered by the Authority it was impossible for the existing staff to devote the time necessary closely to follow up this side of the business.

Co., Ltd., left Paddington on April 27th for a three months' tour of towns in England, Scotland and Wales. A feature of the train is a coach containing generating plant which will provide electricity for lighting the train and for operating the receivers and radio-gramophones.

Disclaimer

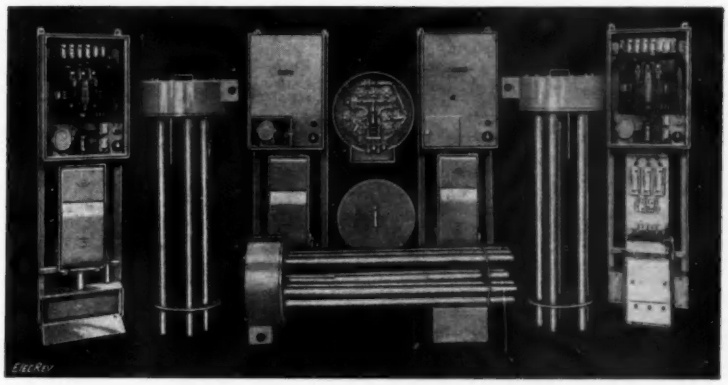
Messrs. Arthurs (Proprietors: Arthur Gray, Ltd.), of 150, Charing Cross Road, W.C.2, ask us to state that they are in no way connected with "Arthur for Wireless," Ltd., for which a receiver and manager was recently appointed (ELECTRICAL REVIEW, April 6th, p. 505).

The Economic Situation in Hungary

The feature of economic conditions in Hungary in 1933 was the considerable increase in the volume of exports, together with decreases in imports, resulting in a large "favourable" trade balance. A memorandum issued by the Department of Overseas Trade on the position in that country last year states that trade with the United Kingdom continues to be hampered by the import licence system, although easier conditions of payment have been obtained under the "Gentlemen's Agreement." The value of imports of electrical machinery and apparatus declined from 5,143,000 pengös in 1923 to 2,687,000 pengös, the United Kingdom's share of the trade falling from 2,329,000 pengös to 299,000 pengös.

A Display of "Heatrae" Products

The accompanying illustration shows a representative group of immersion heater units designed and made by Electric Fires, Ltd., Norwich, for fitting into large storage cylinders; it includes four 50-kW "Heatrae" immersion heaters, each with separate control panel, and arranged so as to show in an effective manner the contactor panel covers, &c., in various positions.



A display of "Heatrae" immersion heaters

A Merger: Correction

On page 603 of our last issue we incorrectly described the title of the company into which Hendersons Wireless & Electrical Service, Brighton, and the Delta Radio Distributors, Ltd., London, have been merged. The name of the company was correctly rendered on page 614 of the same issue under "New Companies Registered," viz., Hendersons Wholesale Electrical & *Radio*, Ltd. The use of the word *Retail* was, of course, a mistake.

A Fair Trading Policy Stamp

The accompanying illustration is a reproduction (actual size) of a poster stamp which has been adopted by the Fair Trading Council for the use of all signatories to the Fair Trading Policy, details of which were published at some length in our issue of January 26th (p. 127). These stamps can be obtained from Mr. F. A. Rogers, secretary to the Council, Kern House, Kingsway, W.C.

The Fair Trading stamp

Radio Valves in France

Although there was a slight decline last year, France is still an important market for radio and other special valves. The imports during 1933 amounted to a value of £572,231, as compared with £643,712 in 1932. The exports of wireless and other special valves from France during the same period also show a decline from £99,500 to £97,787.

Prices of Materials

Messrs. Edward Till & Co. report May 2nd: Indiarubber, Para fine, 5½d., ¼d. inc.

Messrs. James & Shakespeare report May 2nd: No change in the price of copper bars (best selected), sheet and rod. Copper (electrolytic) sheets, £35 15s. to £36 5s., 10s. dec. English pig lead, £12 15s., 5s. dec.

The E.C.A. (India)

The Electrical Contractors' Association of India has removed to New Stock Exchange Building, Room No. 64, Apollo Street, Fort, Bombay.

The Trade Mark Committee's Report

The report of the Departmental Committee on the Law and Practice relating to Trade Marks, appointed four years ago, is now available (Stationery Office, Cmd. 4568, price 1s. 6d.). Among the more important conclusions reached by the Committee are the following: Greater freedom should be permitted in the assignation of a trade mark and in the use of marks under the authorisation of the proprietor. The existing requirement of two years' user for registration in Part B should be abolished. Where the name of the subject of a patent has become a common public word for the article (or substance), the proprietor should be able to protect the trade mark if after a period of two years after the expiry of his patent he can show that his trade mark is not the only practicable name or description of such an article (or substance). The proprietor of a trade mark should be empowered to prohibit certain acts which might injure the reputation or impair the value of his mark. The Committee states, however, that it cannot recommend that the proprietor of a registered trade mark should be empowered to attach price-maintenance conditions to the sales of goods bearing his trade mark.

Accumulator Charging

"Charging for Profit" is the title of a well-got-up 44-page booklet now being circulated to the trade by the Edison Swan Electric Co., Ltd. Its aim is to enable charging station operators to increase the efficiency of their stations, and many diagrams and half-tone illustrations are included. The authors are H. W. Gambrell and T. W. Price.

New Branch at Bristol

A new branch office of the United Dominions Trust, Ltd., was opened at Bristol on May 2nd. It will serve the interests of United Dominions Trust (Electric), Ltd., as well as those of the parent company and will in consequence afford greater facilities for electrical contractors and electrical interests generally in the West of England. Mr. A. J. Mountford, who has represented the company in Bristol for some time, will have charge of the office, which is at 31, Corn Street (telephone number: "Bristol 24470").

Australian Lamp-marking Order

The Australian Government has recently issued additional instructions with regard to the requirement of an indication of the country of origin on incandescent lamp bulbs. Where it may be impracticable to indicate the country of origin on the bulbs themselves, the necessary marking must appear on the immediate container. Marking of voltage and wattage is necessary only on lamps used for general lighting purposes. Automobile lamps need only a mark of origin.

Conditions in Costa Rica

Its geographical proximity makes it probable that the United States will continue to supply most of Costa Rica's imports. According to a Department of Overseas Trade report on economic conditions in that country (Stationery Office, price 1s.), the proportion of imports from the United Kingdom and Colonies has tended to fall slightly up to 1931, but that of 1932 showed a slight increase. The price of goods manufactured in the United Kingdom up till September, 1931, was too high for the local market; but with the departure of the United Kingdom from the gold standard, the increase in the proportion of imports from the United Kingdom in 1932 indicates a slight improvement. In 1931 the total value of imported electrical goods was £72,830, which compares with £79,933 in the preceding year.

Dutch Radio and Lamp Exports

During the first quarter of the year Dutch exports of radio materials amounted in value to only 8,053,000 fl., as against 14,276,000 fl. in the previous three months and 10,650,000 fl. in the corresponding quarter of 1933. A reduction also took place in the export of metal filament lamps, the value in the March quarter being 1,771,000 fl., as against 2,319,000 fl. in the last quarter of 1933 and 2,259,000 fl. in the first quarter of that year.

British Malaya's Lamp Imports

According to the *Board of Trade Journal* imports of electric lamps (including automobile and flashlamps) amounted in

value to $216,000 in 1933, as compared with $189,000 in the preceding year. Great Britain's share of the trade increased from 45.8 to 46.2 per cent., and Japan's from 9.2 to 15.9 per cent. Imports of electrical lighting accessories declined, however, from $172,000 to $60,000, of which Great Britain supplied 72.0 per cent. (as compared with 86.8 per cent. in 1932) and Japan 16.0 per cent. (2.8 per cent.).

A Public Address Coach

The Switchit Service, Ltd., Brighton, has recently completed a new relay and public address coach. A special feature of this equipment is that it has a 5-kW generator driven from the engine for the purpose of supplying electricity for floodlighting and music. The equipment comprises two separate amplifiers giving 100-W each, which feed a specially designed loud speaker fitted in a lift shaft so that it may be lowered into the van when not in use, for travelling convenience. The control panel handles the input from four separate microphones,

The new public address coach of the Switchit Service, Ltd.

and, as the amplifier is in two sections, two separate performances can be handled at the same time. No baffle or horn is used in this type of loud speaker. The lighting of the inside of the coach is carried out on a 230-V system and there is a generator on board enabling neon signs to be used on the outside of the van if desired. The amplifiers can be used whilst travelling.

French Trade in Domestic Appliances

The appended table shows the French imports and exports of domestic electrical appliances during the whole of the past year. It will be seen that both sections of the trade continued to feel the effects of the industrial depression, imports declining by £92,575 and exports by £3,600.

	Imports.		Exports.	
	1932. 1,000 fr.	1933. 1,000 fr.	1932. 1,000 fr.	1933. 1,000 fr.
Electric heating stoves and apparatus	4,647	4,479	2,668	2,938
Electric irons	223	172	210	260
Vacuum cleaners, boot cleaners, etc.	6,051	4,382	7,055	6,447
Refrigerating machines ...	10,185	4,356		
Electric fans	1,004	1,315		
Total fr.	22,110,000	14,704,000	9,933,000	9,645,000
Total at 80 fr. to £ ...	£276,375	£183,800	£124,162	£120,562

The chief feature of the import side is the decrease in the imports of electrical vacuum cleaners and refrigerators. As regards the exports, it will be seen that there was a slight increase in cooking and heating stoves and also in electric irons.

The imports of radio apparatus, excluding valves imported separately into France during last year, attained a value of £864,325, as compared with £1,213,687 in 1932. During the same period there was an increase in the exports of wireless material from France, from £209,237 to £288,237.

Social Event

The Lewcos Dramatic Society is presenting "Hawk Island" at the Guildhall School of Music on Tuesday next at 8 p.m.

Recent Contracts

The Chloride Electrical Storage Co., Ltd., has recently received an order for Exide-Ironclad batteries to equip one hundred of the new electric vehicles being constructed by Messrs. Partridge, Wilson & Co., of Leicester, whilst in addition it has received a further contract for twenty-eight Exide-Ironclad batteries for use in the electrically operated vehicles employed by the Birmingham Salvage Department.

The English Electric Co., Ltd., has received an order from the Bridport Corporation for a Diesel engined alternator set. The plant will comprise a 5L type mechanical injection four-stroke Diesel engine, having a normal full load output of 625 b.h.p. at 375 r.p.m., direct-coupled to a 430-kW alternator with overhung exciter, generating power at 6,600 V, 3 phase, 50 cycles.

Steatite & Porcelain Products, Ltd., has received an order to supply insulators for the Madras Government. The contract has been placed with the company by the main contractors, British Insulated Cables, Ltd., and it covers the supply of 22,000 suspension insulators to be used in the erection of 82 miles of double circuit 66-kV transmission line between Erode and Trichinopoly in connection with the Pykara hydro-electric scheme. For the same scheme the company is supplying all the insulators for the 66-kV isolating switches and other sub-station insulators for the Metropolitan-Vickers Electrical Co., Ltd., and the British Thomson-Houston Co., Ltd.

A contract has been signed in London between the Polish State Railways and the Westinghouse Brake & Saxby Signal Co., Ltd., for the supply to the Railways of brake equipment for 39,000 wagons and pipe equipments for a further 73,000 wagons. The contract is valued at £4,771,892 and the supply of this equipment will extend over a period of six years. The Westinghouse Co. has also received an order from the London Passenger Transport Board for the supply of electro-pneumatic brake equipment for the whole of the rolling stock on the Edgware, Morden and Highgate Line. The total number of vehicles which will be equipped is between 750 and 800. Similar equipment has been in operation for some time throughout the Piccadilly Line, and on certain of the District Railway rolling stock.

The Cambridge Instrument Co., Ltd., has received an order from Improved Metallurgy, Ltd., for temperature recorders and indicators for their new plant. The contract includes twenty potentiometric 4-point recorders and two 18-point indicators, all flush-mounted on four steel panels, together with a large number of thermocouples and several other instruments.

Trade Announcements

The India Rubber, Gutta Percha & Telegraph Works Co., Ltd., has removed its head office and London sales office to Thames House, Millbank, S.W.1. (Telephone: Victoria 8323).

From May 7th the telegraphic address of Messrs. Brown Brothers, Ltd., will be "Imbrowned, Finsquare, London."

A London warehouse has been opened by the Northern Aluminium Co., Ltd., at 212-216, Pentonville Road, N. (telephone: Terminus 4512), where stocks of aluminium and its various alloys in the form of ingots, plates, sheets, tubing, &c., will be carried.

Messrs. Henry Simon (Engineering Works), Ltd. (proprietors of Turbine Gears, Ltd.), announce that they have taken over from Messrs. John Hetherington & Sons, Ltd., Manchester, the designs, patterns and jigs of the "Robey-Smith" patent bevel gear planer and the "Smith & Coventry" patent spiral bevel gear planer, as designed and developed by the original patentees, Smith & Coventry. Messrs. Simon will shortly commence manufacture of these planers at their Cheadle Heath works, and will also be in a position to supply tools for the various sizes of machines.

Mr. E. Kramrisch, electrical manufacturers' agent, has removed to Vereker Buildings, Greene Street, Rathbone Place, W. His telephone number (Museum 3358) remains unchanged.

Messrs. Partridge, Wilson & Co. have removed their Scottish branch to 21, Douglas Street, Glasgow.

New Catalogues and Lists

Siemens & General Electric Railway Signal Co., Ltd., Central House, Kingsway, W.C.2.—A catalogue of train describing equipment.

Cressall Manufacturing Co., Birmingham.—Leaflet on "Cressall" flat-ribbon resistance grids.

W. T. Henley's Telegraph Works Co., Ltd., Holborn Viaduct, E.C.1.—A leaflet on a new l.p. quick-break switch for pole mounting.

Electro-Surplus, Ltd., Annandale Street Lane, Edinburgh.—A card giving a list of the company's insulating materials.

Callender's (London) Football Team, who head the London Business Houses 2nd League, 3rd Division, and are the winners of the "Pipkin" Cup

Batteries, Ltd., Hunt End Works, Redditch.—A catalogue on the new "Nife" miner's high candle power electric safety lamp.

Simplex Electric Co., Ltd., Empire House, Gt. Charles Street, Birmingham, 3.—Particulars of the "Creda" low-voltage boiling plate.

British Aluminium Co., Ltd., Adelaide House, E.C.4.—An illustrated pamphlet entitled "Aluminium in Industry."

Igranic Electric Co., Ltd., 148, Queen Victoria Street, E.C.4.—A pamphlet on the "Stayalite" emergency lighting control.

A.B. Electric Co., Ltd., 60, Newman Street, W.1.—A price list (trade) of the company's products.

Power Contracts (Batwin), Ltd., 138, Southwark Street, S.E.1.—A catalogue of motors and particulars of the "Batwin" circuit-breaker.

Berry, Wiggins & Co., Ltd., Tensulam House, Water Lane, Stratford, E.15.—A 44-page illustrated booklet on "Kingsforth" electrical filling and sealing compounds.

Alliance Wholesale, Ltd., 62, Great Russell Street, W.C.1.—Particulars of the "Bloomsbury" lighting unit.

Gent & Co., Ltd., Faraday Works, Leicester.—A complete catalogue of "Tangent" electro-motor syrens.

Falk, Stadelmann & Co., Ltd., 83, Farringdon Road, E.C.1.—A comprehensive 180-page illustrated catalogue of electrical supplies of all kinds.

Sun Electrical Co., Ltd., 118, Charing Cross Road, W.C.2.—A new 64-page lighting fittings catalogue.

Lunken Co., Ltd., 35, Great Dover Street, S.E.1.—Catalogue of small tachometers.

L. G. Hawkins & Co., Ltd., 30/35, Drury Lane, Kingsway, W.C.2.—A broadsheet on the "Supreme" culinaire, &c.

Bankruptcy Proceedings

A. E. Scott-Smith, Linden Lea, Brooklands Road, Brooklands, Cheshire, electrical factor.—Liabilities of £3,683 and no assets were disclosed at the resumed public examination of this debtor on April 27th. The failure had been attributed to insufficient commencing capital, selling without sufficient margin of profit, and extravagant living. In reply to questions, debtor said his living expenses amounted to £1,000 a year. He had purchased all his stock in the business from one firm, and when they offered large discounts on big orders debtor bought heavily. He commenced trading in 1928, and at first made a profit of 10 per cent. on his sales. In 1929 he became in arrear with his accounts, and in 1931 he endeavoured to increase his turnover by selling wireless goods. In 1932 the sales amounted to £15,000. He admitted that he had sold the majority of his goods to one firm, and at times had disposed of the stock at less than cost price so that he could get money to pay his accounts. The examination was adjourned further to allow debtor to supply detailed trading accounts.

B. Bell, Ladbrooke House, London Road, Biggleswade, Beds, electrical engineer.—The public examination in this matter was to have been held recently, but the Official Receiver stated that in spite of an order, the debtor had failed to appear, and he therefore had applied for a warrant for his arrest. The examination had first been fixed for September 19th, 1933, and had been continually adjourned since that date. He could produce a letter to show the debtor was well and able to attend. The Registrar granted the application for a warrant and adjourned the examination to a date to be fixed immediately after the debtor's arrest.

P. R. Slattery, 26, Cleveland Road, Lytham, Lancs, lately trading at Tarleton, near Preston, electrical contractor.—The public examination was held at the Sessions Hall, Preston, on April 27th. The statement of affairs showed a deficiency of £94, and debtor attributed his failure to incurring losses through under-estimating. The hearing was adjourned.

S. M. Shackleton, 14, Colliergate, Yorks, wireless engineer.—The public examination of this debtor was held at York on April 26th. The statement of affairs showed ranking liabilities of £962 and assets of £58, leaving a deficiency of £904. The examination was closed.

J. A. J. Boston, electrical and radio engineer, 123, High Street, Staines.—Receiving order made April 24th on debtor's own petition.

J. Webster, electrical and radio dealer, 65, Moss Lane, Orrell Park, Liverpool, and 231, Warbreck Moor, Aintree, Liverpool.—Receiving order made April 25th on debtor's own petition. First meeting May 4th at Government Buildings, Victoria Street, Liverpool. Public examination June 5th at the Court House, Liverpool.

A. H. Latham and **R. C. Plant** (Latham & Plant), wireless and electrical dealers, 35, Lowlands Road, Harrow.—Receiving order made April 25th on debtor's own petition. First meeting May 9th and public examination June 29th, both at Bankruptcy Buildings, Carey Street, W.C.

G. D. Whitham, electrical engineer, 86, Orford Lane, Warrington.—First and final dividend of 3s. 10½d. in the £, payable May 4th at 2, Bixteth Street, Liverpool.

M. Chesler, wireless and electrical dealer, 329, Coventry Road, Small Heath, Birmingham.—Public examination May 30th at the Court House, Birmingham.

Company Liquidations

Torquay Tramways Co., Ltd.—Winding up voluntarily. Joint liquidators: Mr. H. T. Barnett, Westwood House, Tilehurst, Berks, and Mr. E. A. Bond, 83, Kingsway, W.C.

Carr & Childe, Ltd.—Winding up voluntarily. Liquidator, Mr. W. Walker, 7, Greek Street, Leeds.

Jersey Electric Lighting & Power Co., Ltd.—Winding up voluntarily. Joint liquidators, Mr. C. M. Duncan, 19a, Coleman Street, E.C., and Mr. J. N. A. Houblon, 424, Salisbury House, London Wall, E.C.

W. & F. Wills (London), Ltd.—Winding up voluntarily. Liquidators, Mr. P. S. Booth, 14-17, Holborn Viaduct, E.C., and Mr. B. E. Nightingale, 3, Duke Street, Adelphi, W.C.

Pewsey Electric Lighting Co., Ltd.—Winding up voluntarily. Liquidators, Messrs. T. Fowle and A. J. Phillips.

Dissolutions of Partnership

Davis & Winch, electrical and general engineers, 31 and 31a, Askew Crescent, Shepherd's Bush, W.—Messrs. C. E. Davis and H. E. Winch have dissolved partnership. Mr. Winch will attend to debts and carry on the business.

J. A. Wigg & Co., electrical and general engineers, 22, Windmill Street, Tottenham Court Road, W.—Messrs. E. D. Hopgood and B. J. Blackmore have dissolved partnership. Mr. Blackmore will attend to debts and carry on the business.

Electricity Supply

Lighting, Domestic, Power

Ashton-under-Lyne.—EXTENSIONS.—The Town Council has applied for sanction to a loan of £8,218 for extensions of the h.p. mains and the erection of an additional sub-station.

Barnsley.—LOAN.—The Town Council has received sanction to a loan of £34,500, of which £20,000 is for prospective mains and services, £4,011 for mains extensions, £489 for transformers and switchgear, and £10,000 for hired wiring.

Bedford.—LOAN.—The Town Council has applied for sanction to borrow £32,342 for reinforcing the general supply mains, and £32,066 for additional mains for supplying brickworks.

Belgium.—PROGRESS DURING 1933.—The recently issued report for 1933 of the Compagnie Générale d'Entreprises Electriques et Industrielles (Electrobel), of Brussels includes a table giving a record of the progress of eight of its affiliated electricity distributing undertakings. The table shows that during 1933 the number of consumers increased from 344,808 to 368,833, the connected load from 324,368 to 346,939 kW, and the length of the distributing lines from 7,695 to 7,973 miles. The report states that the sales of power during the year declined by 1½ per cent.

Birkenhead.—REDUCTIONS IN CHARGES.—The Electricity Committee has decided upon an all-round reduction in the flat rate of ¼d. per kWh and a slight reduction for shop-window lighting and advertising. On the power rate there is a reduction of ¼d. up to 1,000 kWh. In the rateable value system for private houses only the present fixed charge of 14 per cent. per annum, plus ¼d. per kWh, is revised to the benefit of the consumer. The charges for commercial cooking and baking are reduced by ¼d. per kWh on the minimum consumption of 8,000 kWh.

Birmingham.—MORE ELECTRICITY USED.—The Electricity Committee reports that almost 20 per cent. more electricity was used during the first three months of this year than during the corresponding period of last year.

Burford (Oxon).—POWER STATION GUTTED.—During Thursday evening last week the power station of the Burford Electric Light & Power Co. was burned down. Mr. N. F. Nalder, managing director of the company, states that no engines were running at the time, and it is therefore believed that the fire started in the neighbourhood of the oil tanks. Shortly after the outbreak the Wessex Company cut off the high-voltage supply at Swinbrook, and rendered considerable assistance in restoring the supply to the affected area. Mr. Nalder estimated the damage at £2,000, and said that the station was undergoing conversion to take a bulk supply. A picture of the burnt out power station appears on page 633.

Bury.—LOAN.—It is estimated that £15,000 will be required to complete the change-over to a.c. and £20,000 for extensions to mains, and sanction to a loan of £35,000 is therefore being applied for.

Cadishead Moss.—FARMERS WANT ELECTRICITY.—Farmers at Cadishead Moss have asked the Stretford and District Joint Electricity Board for a supply of electricity and are prepared to guarantee £75 per year for five years. The Board states that it will cost £2,000 to lay the cables, &c., and the interest charges would be £100 per annum. If the farmers would increase their guarantee by another £25 the course would be clear. The farmers say they are prepared to shoulder three parts of the £100 guarantee required, but think the householders in New Moss Road should bear the rest.

Canterbury.—EXTENSION OF SUPPLY.—The Bridge-Blean Rural District Council has received plans from the South-East Kent Electric Power Co., Ltd., of the route of a h.p. main for supplying electricity in the area, and this will give supplies to Sturry, Fordwich, Westbere, Littlebourne, Ickham, Wickhambreux, Patrixbourne, and Bridge.

Dundee.—NEW SUB-STATIONS.—An expenditure of £14,000 for the provision of four new sub-stations has been passed by the Electricity Committee. The transformer equipment for all four will cost £6,100.

Exeter.—REDUCED CHARGES.—The Electricity Committee has decided to reduce charges for ordinary lighting from 4½d. to 4d. per kWh. and the kilowatt charge under the two-part tariff system from £4 to £3 15s. per quarter.

Finchley.—LOAN.—The Electricity Committee is to apply for sanction to borrow £18,000 for mains and services, and is to extend mains at a cost of £592.

Glasgow.—ASSISTED WIRING PROGRESS.—Under the Corporation's scheme 101 houses were wired in March, making the total to date 38,820.

MAINS EXTENSIONS.—The Electricity Committee has decided to lay distributing mains at a cost of £4,320.

REDUCED CHARGES.—At the budget meeting of the Electricity Committee, the convener intimated that, as they expected a substantial surplus on this year's working, they were able to approve of a reduction for the next financial year, which would result in a saving to consumers of £75,000. The reductions in charges for the next financial year would come into effect after the reading of the meters next month. The

primary rate for domestic consumers has been reduced from 3½d. to 3d. per kWh and the domestic service tariff has been reduced from ½d. to ⅜d. per kWh. Industrial power consumers are also to benefit, as the "unit" charge for e.h.p. alternating current is reduced from 0.22d. to 0.18d., and the corresponding charge for low-voltage supply has been reduced from 0.24d. to 0.20d.

Glossop.—POSITION OF UNDERTAKING.—The Urban Electric Supply Co., Ltd., has intimated that it would be prepared to accept £66,500 for the undertaking. The Town Clerk is to inquire of the company to what extent it would be prepared to reduce the present price of electricity if the Corporation agreed to extend the period of option of purchase in the agreement dated June 22nd, 1900.

India.—GENERATION BY OIL ENGINES.—The Department of Industries, Mysore, has been conducting experiments in connection with the production of electrical energy by means of internal-combustion engines driven by producer gas, large quantities of charcoal for this purpose being available in Mysore. The results of these experiments are considered satisfactory, as it has been found possible to generate power in small and medium-sized plants at a cost of about one anna per kWh. There are a number of localities in Mysore where the demand for power is insufficient and where the distance from the hydro-electric grid is too great to justify the laying of feeder cables, etc., but where, nevertheless, producer gas plants might profitably be installed for the supply of electric power to minor industries.—*Indian Engineering.*

Isle of Man.—THE ELECTRICITY BOARD'S PROGRESS.—The Isle of Man Electricity Board reports satisfactory progress during the first year of its operation. In a little over a year 72 miles of overhead line have been erected, besides 30 miles of low-voltage distribution. Eleven hundred applications for supply have been received, and 900 applicants have already been connected up.

Jarrow-on-Tyne.—CHANGE-OVER.—The North-Eastern Electric Supply Co., Ltd., is to change the system of supply, the proposal having been approved by the Town Council.

Kettering.—STREET LIGHTING.—The Highways Committee has approved a scheme for the provision of central electric street lighting in several roads at a cost of £4,300.

LOAN SANCTIONED.—The Electricity Committee has obtained sanction to borrow £14,000 for the purpose of providing wiring installations.

Kingston-on-Thames.—LOAN.—The Town Council has applied for sanction to a loan of £3,200 for the assisted-wiring scheme. The charge for electricity for places of worship is to be reduced by 1d.

Lewes.—EXTENSION OF SUPPLY.—The Weald Electricity Co. has decided to extend mains to Ripe and Chalvington.

Lichfield.—DUPLICATE MAINS.—The Walsall Electric Supply Committee has entered into an agreement to provide a duplicate main from Aldridge to Lichfield, together with the necessary switchgear, at a cost of £2,400.

SUPPLY EXTENSIONS.—The City Council is to apply for sanction to loans of £947 for a supply of electricity to the pumping station of the local Water Co., £685 for a supply to Stonnall and Lynn, and £459 for a similar purpose for a supply to Wirral and Chesterfield.

London.—HAMMERSMITH.—The Electricity Committee is to provide a supply to a block of 269 flats at King's Court, King Street, at a cost of £2,024.

POPLAR.—The Electricity Committee is to apply for sanction to borrow £5,000 for mains extensions. It was reported early last year that the Council had authorised alterations to the switchgear at Glengall Road and Farmgate sub-stations, and a question has now arisen regarding the rupturing capacity of the switchgear at High Street, Poplar, and Wick Lane sub-stations. The borough electrical engineer is to submit proposals for the renewal of the switchgear at these stations at an early date.

ST. MARYLEBONE.—The Electricity Committee is to install rising mains at a cost of £230, to supply forty flats at Florence Court, Maida Vale. Last July the Council decided to use electricity for water heating at the Seymour Place public baths, and decided that the inclusive charge for water heating and other requirements should be a sum not exceeding £3,000. The charge of £3,000 represented approximately £2,500 for heating and steam requirements, and £500 for lighting and other uses. These charges were framed upon costs at that time, and the Ministry of Health (in considering the Council's application for sanction to a loan for the development of the site) has suggested that the charges should be fixed for application as from the opening of the new baths, in about two years' time. The Ministry is prepared to approve the "all-electric" scheme if the annual charge for heating and steam as from the opening of the baths is fixed at £2,100, subject to variations for fuel costs, &c., which it regards as comparable with the annual charges for a coke installation. The Committee accordingly recommends that the inclusive charge to the general account for all electricity supplies to the new Seymour Place public baths as from the opening of the premises should be £2,600 inclusive, being £2,100 for heating and steam requirements, and £500 for lighting and other uses, subject to variations for fuel costs, and subject also to the charge being reviewed annually thereafter.

ELECTRIC SIGNS.—In view of the increased use of luminous-discharge-tube signs of large superficial area, the L.C.C. has intimated that it will in future be prepared to dispense with observance of the bylaws for the regulation of lamps, signs and other structures overhanging the public way to permit the erection at cinemas and theatres of such signs provided they do not exceed 13 in. in projection from the face of the building if the street is less than 30 ft. wide or 18 in. in projection if the street is of a width of 30 ft. or more. The Metropolitan Boroughs' Standing Joint Committee has informed the L.C.C. that it is of the opinion that legislation should be promoted to enable bylaws to be made to secure the regulation of all types of signs used for advertising purposes, including overhanging signs, illuminated signs, sky signs, advertisement hoardings, &c. The Standing Joint Committee is further considering the question of the regulation of signs generally, and has invited the Advisory Body of Metropolitan Town Clerks and Borough Engineers to appoint representatives to confer with it on the matter.

ST. PANCRAS.—The Electricity Committee recommends that two low-voltage feeding mains costing £1,470 and a low-voltage distributing main (£1,184) be laid, and that the existing cable in Albert Road be replaced by a four-core cable at a cost of £1,044.

BETHNAL GREEN.—A proposal to carry out extensions at a cost of £39,000 has been approved.

Lytham St. Annes.—REDUCED CHARGES.—The Council is altering the price of electricity to 6d. per kWh ordinary tariff, a decrease of ½d. The all-in tariff will also be reduced by ½d. per kWh.

Margate.—REDUCED BUSINESS TARIFF.—The Isle of Thanet Electric Supply Co., Ltd., has reduced charges for business premises in Margate. On the two-part tariff, the existing annual charge for lighting purposes of £17 10s. per kW installed for the first 2½ kW, with a minimum of ½ kW, and £15 per kW in excess of this figure, has been reduced to £10 per kW with a minimum of £5 per annum, plus a "unit" charge of 1d.

Plymouth.—DEVELOPMENTS.—The Electricity Committee has approved a scheme for further cable extensions, transformers and sub-station buildings at an estimated cost of £81,161.

Preston.—TRANSFER.—Preston Corporation has agreed to Forton, Cleveley, Holleth, and part of Nether Wyresdale being transferred to Lancaster Corporation's area of supply.

Rawtenstall.—NEW METERS.—The Electricity Committee has obtained sanction to borrow £5,000 for the provision of meters.

Salford.—X-RAY EQUIPMENT.—The Health Committee in applying for sanction to borrow £2,000 for the provision of X-ray apparatus at Hope Hospital.

Stoke-on-Trent.—SUPPLY TO FACTORY.—The Electricity Committee is to provide a supply, at a cost of £750, to factory extensions in New Street, Burslem, for Messrs. J. Sadler & Sons, Ltd.

MAINS EXTENSIONS.—The Electricity Committee is to extend mains and provide sub-station equipment at a cost of £1,200.

LOANS SANCTIONED.—The Electricity Committee has obtained sanction to borrow £940 for a sub-station, £1,850 for additional mains on the Harpfield Estate, and £5,000 on account of a general change-over of supply.

Tenterden.—REDUCED CHARGES.—The Weald Electricity Supply Co., Ltd., has made a reduction in the charges throughout the district, amounting on the average to 25 per cent.

OVERHEAD LINES.—The Council has raised no objection to the erection of an overhead line from Tenterden to Wittersham, and has asked the company to extend the line so as to link up with Stone-in-Oxney, Appledore, Kenardington, and Woodchurch.

Todmorden.—REVISED CHARGES.—The Electricity Committee has decided that the following alternative scale of charges shall be offered to shopkeepers as an experiment during the year ending at the reading of the consumers' meters for the March quarter, 1935: 7d. per kWh from 3 p.m. to 6 p.m., and 3d. per kWh from 6 p.m. to 3 p.m., the minimum quarterly payment to be the amount of the average quarterly payment for the shop for the calendar years 1931-3, and consumers to pay a rent of 5s. a quarter for a time-switch.

Wallasey.—MAINS EXTENSIONS.—The Electricity Committee is to lay l.p. mains in Reeds Lane and Reedsville Grove, at an estimated cost of £1,500, and h.p. and l.p. mains in various thoroughfares, at an estimated cost of £2,070, and also extend the main in Hoylake Road at a cost of £1,244.

Whitehaven.—REVISED TARIFFS.—The Town Council has adopted the following revised tariffs:—Factory, workshop and shop heating, etc., first 120 kWh per quarter per kW of demand, 1¼d. per kWh; excess above 120 kWh at ¾d. After hour shop and sign lighting, for a minimum period of four hours per day after 6.30 p.m., 1½d. per kWh, with a rental for time switch and meter of £1 per annum; maximum demand rate, "unit" charge reduced from 2¼d. to 2¼d.

STREET LIGHTING.—The Town Council is to give a supply of electricity for street lighting at Hensingham at a cost of £1,146, for which sum a loan is to be applied for.

Yeovil.—SUPPLY TO COUNCIL HOUSES.—The Town Council has granted permission to the Yeovil Electric Light & Power Co., Ltd., to supply electricity under its two-part tariff and assisted-wiring scheme to Council houses at Goldcroft upon the request of tenants, and for this purpose to run an insulated cable along the backs of the various blocks of houses.

Traction

Belgium.—TROLLEY BUSES AT LIEGE.—After experimentally running a number of British-built electric trolley buses in the Liège district for some time past, the Société des Tramways de Liège et Extensions has recently secured the concession to run such vehicles over several additional routes. It has also been authorised to substitute trolley buses for the old electric tramways on the route between Guillemins and Vivegnis railway stations. The orders have been placed with Belgian firms.

France.—TRAFFIC SIGNALS.—The Paris Traffic Committee has adopted a recommendation that the existing traffic signals, which consist of a single red lamp and a warning bell, shall gradually be replaced by the type employing red, yellow, and green lamps without a bell.

Glasgow.—TRAMWAY EXTENSIONS.—The Town Council is to consider the completion of the tramway between Hillfort and Milngavie.

Italy.—UNDERGROUND RAILWAY FOR GENOA?—The Lord Mayor of Genoa is seriously considering the question of the construction of the underground railway in the town. The projected route is from Sestri to Nervi.

Sheffield.—TRAMWAY EXTENSIONS.—Tramway routes are to be extended to Firth Park and Meadow Head, Intake and Handsworth.

Traffic Signals.—At a cost of £18,000, traffic signals are to be installed on roads throughout Lancashire. A start is being made on road "A6" from Salford to the boundary of Westmorland. Derby Town Council is to install vehicle-actuated signals at the top of Green Lane. Durham County Council has been asked by Billingham U.D.C. to provide signals at the junction of by-pass road New-road and Norton-road. The Gillingham Town Council has asked Chatham to co-operate in the erection of automatic signals between Ash Tree and Star Mills Lanes, Watling Street. The Halifax Town Council is inviting tenders for the erection of time-controlled traffic signals at King's Cross. The Notts County Council proposes to install automatic traffic signals at Beaumond Cross, Newark. The West Sussex County Council has approved the installation of automatic traffic signals at King's Drive, Shoreham-Worthing Road, Shoreham. The Tunbridge Wells Town Council is to install automatic control signals at Mount Pleasant-Crescent Road; High Street-London Road-Mount Sion; Carr's Corner; and "Royal Oak" Corner. The Finchley Highways Committee is to erect traffic signals at Great North Road junction (£779).

Wakefield.—TRAM DEPOT EXTENSIONS.—Yorkshire (West Riding) Electric Tramways Co., Ltd., is having plans prepared for £27,000 extensions to its central depôt.

Communications

Australia.—SHORT-WAVE BROADCASTING.—Mr. H. P. Brown, Director-General of Posts and Telegraphs, states that experiments at the short-wave wireless station at Lyndhurst, Victoria, in radiating programmes of the Australian Broadcasting Commission's service, have been highly successful, and that the problem of long-distance reception in Australia is nearer solution. In addition to giving listeners in the most remote parts of Australia satisfactory reception, the broadcasts have also been successfully received overseas.

GOVERNMENT AND WIRELESS SERVICES.—The Federal Government is expected to make a decision soon on the proposal that the postal department should take over the overseas wireless services at present operated by Amalgamated Wireless (Australasia), Ltd. It is understood that the cost of buying out the private shareholders would be about £750,000, and if the Ministry decides to proceed legislation will be submitted to Parliament and provision for the money will be made in the loan estimates. The Government, however, does not wish to interfere with the manufacturing activities of the company, and the £750,000 represents the amount required to compensate private shareholders for taking over the overseas wireless communications only. Mr. Parkhill, Postmaster-General, who has been discussing the matter in this country, is on his way back to Australia, and a decision is expected soon after his arrival.

China.—TELEPHONE PROGRESS.—According to the *Chinese Economic Bulletin*, the total mileage of long-distance telephone lines in Shantung province amounts to 3,400 miles, with 104 districts linked up by the service. Installation work is in progress in several other districts.

RADIO LINK WITH ITALY.—Another radio station is to be constructed at Chenju, near Shanghai, for a direct radio circuit between Italy and China. Funds for the project have been allotted and the service is expected to be inaugurated by the end of this year.

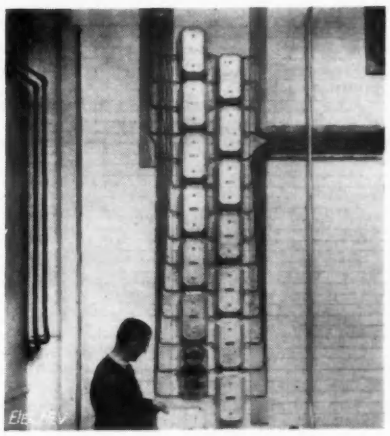
Great Britain.—RELAY STATION FOR WALES?—The chief engineer of the British Broadcasting Corporation, replying to a complaint by the Machynlleth Urban District Council regarding the serious fading of the West Regional station, has stated that the B.B.C. is considering the possibility of setting up a relay station at Machynlleth.

WIRELESS RELAY SERVICES.—The Ilford Highways Committee has decided to refuse to permit the erection of wires across public highways in connection with broadcast relay services.

Glasgow Town Planning Committee has considered applications from several companies for permission to set up a wireless relay service in the city. The committee decided before proceeding further to ask the Corporation to sanction the sending of a deputation to Hull, Newcastle, and other centres where the system is in operation. A representative of one of the applicants stated that no fewer than 250 local authorities had given facilities for installing services in their districts. It was stated that the Hull Corporation was at present receiving about £5,000 per annum in royalties.

Chorley Highways Committee recommends that the Council shall consent to the agreement between the Corporation and Broadcast Relay Services, Ltd., being transferred to a local company under the name of Chorley Relay Services, Ltd.

ANTI-INTERFERENCE DEVICES.—In the building of the new research extension at Hayes, the Gramophone Company decided to ensure that no conducted electrical disturbances should confuse its experiments. The photograph shows the choke and condenser units, designed and supplied by Belling & Lee, Ltd. There are seventeen incoming cables, including 3-phase and single-phase a.c. circuits, d.c. mains supply, and numerous h.t. and l.t. battery supplies. The filter boxes house interchangeable chokes and provide for rapid change-over to four different filter networks. Five different ratings are installed, and provision is made for increasing the chokes to cope with future increases in load.



An anti-interference installation

India.—PROGRESS OF BROADCASTING.—Our Bombay correspondent reports that the Indian Government has stated that the extension of the broadcasting service is engaging its attention and consultations are being held with the local Governments on the subject. It is hoped to begin work this year on the construction of a broadcasting station at Delhi. It is probable that the reception in parts of India that are remote from Calcutta and Bombay will be improved by the provision of local broadcasting at certain selected places. There were approximately 10,950 licences in India on December 31st last. In 1932-33 the total income from the Customs duties was Rs. 2,44,000, and the budget estimate for 1933-34 is Rs. 2,25,000. The expenditure on the Calcutta station was Rs. 104,000 and that on the Bombay station was Rs. 110,000, making a total of Rs. 214,000. During 1930-31 and 1931-32 the service ran at a loss, but in 1932-33 there was a profit.

It is understood that broadcasting will soon be introduced in the Nizam's territory. It is estimated that the initial expenditure will be about Rs. 2½ lakhs.

The Punjab Government has under consideration plans for experiments in rural broadcasting within a radius of 25 to 30 miles from Lahore. A transmitter offered by the B.B.C. will, it is said, be used for the purpose. The object is to find out whether a satisfactory programme can be broadcast which will interest the villager after novelty of the idea has worn off.

In order to encourage the development of broadcasting services, Standard Telephones & Cables Ltd., have made an offer to the United Provinces Government to supply a 300-W transmitter on loan for twelve months, providing that, if the service is satisfactory, the transmitter will be purchased for £825, exclusive of duty, and should the service not be continued the transmitter to be returned and payment of £150 made to cover cost of transport both ways and reconditioning.

Poland.—WIRELESS LICENCES.—During March, 12,212 new licences were taken out and 10,910 were withdrawn, bringing the total to 328,860.

Switzerland.—HIGH-POWER BROADCASTING.—As reported recently, the Beromunster station is to increase its power to 100 kW. Marconi's Wireless Telegraph Co., Ltd., has received the order from the Swiss Telegraph Administration to carry out the work. At the same time, a number of modifications will be effected which will make the station up to date. One of the most interesting of these modifications is the incorporation of the "floating carrier" system, which automatically controls the carrier wave radiated by the station. In this system both the carrier power and the input power are small in the absence of modulation or when a low degree of modulation is present. Deeper modulation automatically increases the carrier power, and consequently the input power, so that higher modulated voltages can be correctly reproduced. Series modulation similar to that at the new Droitwich and Motala stations will be incorporated. The station will be provided with a high-precision crystal drive having a constancy of 5/1,000,000, a figure that will comply with the most stringent international frequency stabilisation requirements.

Contract Information

When "Contracts Open" are advertised in our "Official Notice" pages the date of the "Electrical Review" containing the advertisement is given in parentheses below

Contracts Open

Argentina.—BUENOS AIRES.—May 22nd. National Sanitation Works Department. Two hydro-electric sets, two electric centrifugal pumping sets, and five deep-well pumping sets. (A.Y. 12320.)*

Australia.—BRISBANE.—June 8th. City Council. Traction sub-station equipment. (A.Y. 12283.)*

MELBOURNE.—Posts and Telegraphs Department. June 26th. Battery and magneto P.B.X. cordless type, table pattern telephone switchboards. (A.Y. 12317.)*

June 5th. V.i.r. lead-covered cable. (A.Y. 12325.)*

June 18th. City Council. Electrically driven centrifugal pump. (G.Y. 13707.)*

June 12th. Various types of telephone switches. (A.Y. 12346.)*

June 19th. Multiple-twin lead-covered telephone cable. (A.Y. 12345.)*

State Electricity Commission of Victoria. June 4th. Supply for twelve months of v.i.r. cables. (A.Y. 12347.)*

Cardiff.—May 15th. Corporation. Electrical equipment for extensions of City Isolation Hospital. Specification from Medical Officer of Health, City Hall.

May 14th. Rural District Council. E.h.p. and l.p. overhead lines and pole mounting switchgear and transformers. (April 27th.)

Castle Donington.—May 4th. Rural District Council. Reconditioning of sewage disposal works, including electrically driven centrifugal pumping plant. Specifications from S. C. Eagles, 71, Temple Row, Birmingham (deposit of cheque for £2 2s., payable to H. M. Clifford).

Cheadle and Gatley.—May 14th. U.D.C. Switchgear and one 350-kVA transformer. (April 27th.)

Cleethorpes.—May 7th. Electricity Department. 660-V cables. (April 27th.)

Croydon.—May 4th. Corporation. Cables from June 1st, 1934, to March 31st, 1935. (April 27th.)

Galashiels.—May 4th. Town Council. Various works, including electrical, in connection with the Larchbank Street housing scheme. Schedules from J. and J. Hall, architects; tenders to J. B. Lumsden, Town Clerk.

Glasgow.—May 7th. Electricity Department. Supplies as required for one year of cables, meters and cable tiles. (April 20th.)

Grimsby.—May 4th. Corporation. Vehicle-actuated traffic control signals. Specifications from Borough Engineer, Municipal Offices.

Halifax.—May 12th. Health Committee. Automatic telephone system at the Isolation Hospital, Northowram Hall. (See this issue.)

Hull.—May 15th. Electricity Department. One 25,000-kW turbo-alternator with auxiliaries. (April 20th.)

India.—TRAVANCORE.—June 4th. Government Electricity Department. Turbines, generators, switchgear, transformers, &c. (February 9th.) Date extended from May 7th.

July 9th. 66, 33 and 11-kV circuit lines. (April 20th.)

Kilmarnock.—May 8th. Town Council. Various works, including electrical, at housing schemes shops. Specifications from T. C. Stewart, Clydesdale Bank Chambers; tenders to Town Clerk.

Kinghorn (FIFE).—May 7th. Town Council. Electric lighting and other works at twenty-eight houses to be erected at Eastgate. Particulars from the architects, Williamson & Hubbard.

Kingston-on-Thames.—May 10th. Electricity Department. Stores for period ending March 31st, 1935. (April 27th.)

Kirkcaldy.—May 5th. Corporation. Electrical work in connection with the erection of a branch library and child welfare clinic at Loughborough Road. Particulars from W. Williamson & Hubbard, architects, Kirkcaldy (deposit £1 1s.).

Lanark.—May 8th. County Council. Various works, including electric lighting, at housing scheme. Particulars from P. C. Smith, County Housing and Town Planning Engineer, 13, Clydesdale Street, Hamilton.

Lancaster.—Corporation. E.h.p. cables. Specifications from Borough Electrical Engineer, Electricity Department, North Road.

London.—H.M. Office of Works. May 8th. Supply of mechanical and electrical engineering labour in the Newcastle-on-Tyne, Leeds and Southampton districts for three years. (April 13th.)

FULHAM.—May 16th. Borough Council. Seven electrically driven and one steam-driven boiler-feed pumps. Specifications from Borough Treasurer, Town Hall (£10 10s.).

ST. MARYLEBONE.—May 7th. Borough Council. Underground cables for one year. (April 27th.)

STEPNEY.—June 4th. Supply for one year of meters, demand indicators, and combined meters and demand indicators, conduits, troughs and covers. (April 27th.)

May 8th. Indian Stores Department. Aerial wire and cables. Specifications from Director-General, Belvedere Road (5s.).

POPLAR.—May 24th. Borough Council. One 6,000-kW turbo-alternator, complete with condensing plant and spares. (See this issue.)

Manchester.—May 9th. Electricity Department. Battery and charging gear for switchgear operation. Particulars from H. C. Lamb, manager, Town Hall (deposit £1 1s.).

Middlesbrough.—May 14th. Electricity Department. Twelve months' supply of cables and meters. (April 27th.)

Morocco.—RABAT.—May 14th. Telegraph and Telephone Administration. 46,000 metres of telephone cables. (A.Y. 12344.)*

Newport (Mon).—May 19th. Electricity Department. 6,000-V, 3-phase switchgear. (April 27.)

New Zealand.—WELLINGTON.—Public Works Department. May 29th. One 33-kV oil-immersed circuit-breaker. (A.Y. 12276.)* Three single-phase potential transformers. (A.Y. 12274.)*

May 22nd. Factory-charging equipment. (A.Y. 12249.)*

June 5th. 50-V storage battery and charging equipment. (A.Y. 12245.)*

June 26th. Battery-charging equipment. (A.Y. 12273.)*

Northern Ireland.—BELFAST.—May 18th. Electricity Department. 33-kV cables (underground and submarine), with overhead switching equipment. (See this issue.)

BELFAST.—May 11th. Education Committee. Installation of electric light at Avoneil and Belmont P.E. schools. Town Clerk (deposit £1 1s.).

May 21th. Electricity Committee. Manufacture, supply and delivery of steel poles, finials and control boxes (specification No. W.163). Town Clerk (deposit 10s.).

Nottingham.—May 14th. Corporation. Multi-stage vertical-spindle centrifugal booster pump in series with a centrifugal bore-hole-type pump, electric motor, transformer, &c. Specifications from Engineer, Water Department, Castle Boulevard (£3 3s.).

Pontefract.—May 7th. West Riding Public Assistance Committee. Electric lighting installation at the County Institution. West Riding Architect, County Hall, Wakefield; tenders to Sir J. Charles McGrath, clerk to County Council, County Hall, Wakefield.

Portland.—May 26th. U.D.C. Turbine borehole pump and a.c. motors, Diesel engine and alternator, and transformer and switchgear. (April 27th.)

Preston.—May 12th. Corporation. Supply of electric lamps for twelve months. (See this issue.)

Sheffield.—June 4th. Electricity Department. Two 30,000-kW turbo-alternators, complete with condensing plant and auxiliaries, and six 150,000 lb. water-tube boilers with associated equipment. (See this issue.)

South Africa.—JOHANNESBURG.—May 11th. Municipality. 600 300-A, 6,600-V isolating links. (A.Y. 12329.)*

May 22nd. Insulated wire under an annual contract dating from July 1st. (A.Y. 12352.)*

OUDTSHOORN.—Municipality. May 16th. Steam raising and electrical plant. (G.Y. 13721.)*

PRETORIA.—May 18th. Government Supplies Board. Stationary batteries. (A.Y. 12336.)*

June 1st. Government Supplies Board. Telephone cables, loading coil pots and lead jointing sleeves. (A.Y. 12348.)*

Stanhope (Co. DURHAM).—Parish Council. Erection of overhead electrical network for a supply of electricity to South Frosterley. Engineer, E. C. Lennox, Carliol House, Newcastle-on-Tyne.

Sutton Coldfield.—May 24th. Electricity Department. E.h.p. switchgear and transformer kiosks. (See this issue.)

Taunton.—May 11th. Electricity Department. One 3,750-kW turbo-alternator; 25,000-lb. water tube boiler. (April 13th.)

Uruguay.—MONTEVIDEO.—June 4th. State Electricity Supply and Telephones Administration. Seventy-eight three-phase oil-cooled transformers for outdoor use. (A.Y. 12354.)*

West Hartlepool.—May 12th. Electricity Department. H.p. and l.p. cables for twelve months, commencing June 1st, 1934. (See this issue.)

* Further particulars can be obtained at the Department of Overseas Trade (Inquiry Room), 35, Old Queen Street, S.W.1.

Contracts Closed

Bedford.—Electricity Committee. Recommended. Wiring houses under the assisted scheme at schedule rates. Aspley Guise.—F. C. Atkinson. Bedford.—Electrical Wiring and Service Co.

Chelmsford.—Town Council. Accepted. Sewage pumping plant, with Crompton-Parkinson motors (£1,569).—Blackstone & Co., Ltd.

Finchley.—Highways Committee. Accepted. Traffic signals (£447).—Automatic Electric Co., Ltd.

Glasgow.—Municipal Transport Committee. Accepted. Switchgear for Bearsden sub-station.—Metropolitan-Vickers Electrical Co., Ltd. Extension of traffic control telephones at Subway stations.—Standard Telephones & Cables, Ltd. Welding machines.—Metropolitan-Vickers Electrical Co., Ltd.; British Oxygen Co., Ltd.; English Electric Co., Ltd.

Grimsby.—Electricity Committee. Recommended. Cables (£14,706).—British Insulated Cables, Ltd.

London.—BERMONDSEY.—Electricity Committee. Recommended. 300-kVA transformer (£161).—British Electric Transformer Co., Ltd. Switchgear (£98).—Crompton Parkinson, Ltd. Cable (£113).—Pirelli General Cable Works, Ltd.

HAMMERSMITH.—Electricity Committee. Recommended. Two switchboards, each comprising two transformer and isolating panels, for the supply of electricity to Hammersmith Road (£504).—J. G. Statter & Co., Ltd. E.h.p. switchgear at Wood Lane sub-station (£197).—A Reyrolle & Co., Ltd. Four 250-kVA three-phase transformers (£548).—General Electric Co., Ltd.

POPLAR.—Highways Committee. Accepted. Traffic signals at East India Dock Road (£1,099) and Chrisp Street (£467).—Automatic Electric Co., Ltd.

WESTMINSTER.—Highways Committee. Recommended. Traffic signals at Cambridge Circus (£1,067).—Automatic Electric Co., Ltd.

Manchester.—Electricity Committee. Accepted. Switchgear for Stuart Street power station.—Ferguson, Pailin, Ltd.

Education Committee. Accepted. Electrical installation at Rack House school.—R. Seddon & Sons.

Middlesex.—Health Committee. Recommended. Electrical installation at cottages at the Shenley Mental Colony (£570).—Rashleigh, Phipps, Ltd.

Salford.—Watch Committee. Recommended. Traffic signals: Cross Lane (£412), Chapel Street (£132).—Automatic Electric Co., Ltd.

Sheffield.—Electricity Committee. Accepted. Two 600-kW steel-tank type mercury-arc rectifiers, switchgear and auxiliary apparatus (£7,200).—General Electric Co., Ltd. Two 600-kW and one 464-kW glass-bulb type mercury arc rectifiers, switchgear and auxiliary apparatus (£9,450).—Hewittic Electric Co., Ltd. Sub-station switchgear (£5,220).—A. Reyrolle & Co., Ltd.

Health Committee. Recommended. Six electric vehicles (£11,350).—Electricars, Ltd.

Transport Committee. Recommended. Sixty traction motors (£335 per pair).—Metropolitan-Vickers Electrical Co., Ltd.

Slough.—Urban Council. Accepted. Maintaining the electric lighting installation in 580 houses until September 29th, 1937 (£41 per year).—Kervie Electrical Service Co.

Stoke-on-Trent.—Hospitals Committee. Recommended. X-ray apparatus for dispensary (£981).—L. G. Coade & Co.

Electricity Committee. Accepted. Overhead lines for twelve months (schedule prices).—Callender's Cable & Construction Co., Ltd.

Housing Committee. Accepted. Wiring and fittings for eighty-eight houses on the Carmontside Estate.—F. Hancock.

Tynemouth.—Town Council. Accepted. Switchgear (£1,262).—A. Reyrolle & Co., Ltd.

Electric cables for the next three years (£2,096).—Macintosh Cable Co., Ltd.

Forthcoming Events

Institution of Mechanical Engineers.—Friday, May 4th. Storey's Gate, London. 7 p.m. Informal meeting. "Photo-Electric Cells and their Application." Mr. R. C. Walker.

Royal Institution.—Friday, May 4th. Albemarle Street, W.1. 8.30 p.m. Conversazione.

Birmingham Electric Club.—Monday, May 7th. Annual outing—visit to Messrs. W. D. & H. O. Wills, Bedminster Works, Bristol.

Society of Engineers.—Monday, May 7th. Burlington House, W. 6 p.m. "The Development of the Proposed Manapouri-Deep Cove Hydro-Electric Power Project." L. S. Donnelley.

Illuminating Engineering Society.—Tuesday, May 8th. Institution of Mechanical Engineers, S.W.1. 7 p.m. Annual general meeting. "Recent Progress in Illuminating Engineering in the United States." Mr. S. G. Hibben.

Institution of Civil Engineers.—Tuesday, May 8th. Great George Street, S.W.1. 6 p.m. Annual general meeting.

Institution of Electrical Engineers.—Thursday, May 10th. Institution, London. 6 p.m. Annual general meeting. (*Meter and Instrument Section*).—Friday, May 4th. Institution, London. 7 p.m. "An Experimental Sequel to Faraday's Work of 1831." Prof. W. Cramp. Saturday, May 5th. Summer visit to Birmingham. (*Hampshire Sub-Centre*).—Wednesday, May 9th. University College, Southampton. 7.30 p.m. "Some Aspects of the Electrical Transmission of Power by means of Direct Current at Very High Voltages. Mr. H. Rissik. (*Scottish Centre*).—Friday, May 11th. Dundee. Faraday lecture. "The Electrical Engineer and the Free Electron." Mr. C. C. Paterson.

Institution of Electrical Engineers (*Western Centre*).—May 11-14th. Summer meeting at Sedbury Park Hotel, near Chepstow.

Tramways & Light Railway & Transport Association.—May 23rd-25th. Annual Congress at Southend-on-Sea.

Incorporated Municipal Electrical Association.—May 28th-June 2nd. Liverpool. Annual Convention.

Notes

Cable Glands and Sealing Boxes for Mines

A Specification has just been issued by the British Standards Institution for cable glands and sealing boxes for use in mines, both on the surface and underground, at 250, 660, 3,300, 6,600, and 11,000 V. The construction of glands and the method of securing the metallic covering of the cable to the box are dealt with in detail, and standard minimum clearing spaces and creeping distances are laid down. Full particulars are also given for the construction of sealing boxes, particularly those attached to apparatus, and an appendix dealing with the jointing, bonding, and scaling of cables has therefore been included as a guide to users. Copies of this Specification (B.S.S. No. 542-1934) can be obtained from the British Standards Institution, 28, Victoria Street, S.W.1, price 2s. 2d., post free.

Wembley Stadium Loud Speakers

Said to be one of the biggest installations of its kind in Europe, the public-address apparatus of the Empire Stadium, Wembley, has now been made permanent. The Philips apparatus includes a 600-W amplifier, giving 120 W undistorted output, a double turntable gramophone cabinet, two microphones, fourteen large loud speakers, and two high-capacity rectifiers for loud-speaker field excitation. The amplifier valve is a Philips type MA 4/600 operating at an anode potential of 4,000 V and dissipating approximately 600 W. There are two rectifier valves, type 1762. The amplifier is housed in an earthed metal casing so constructed that all power is automatically cut off on the opening of the inspection gate.

Television

On April 30th the Postmaster-General said he proposed to set up a committee to consider the development of television and to advise on the conditions under which any public television service should be provided. He hoped to be able to announce at an early date the composition of the committee and its terms of reference.

A Large Cooking Installation

On page 631 of this issue we reproduce some photographs of the recent extension to the London School of Economics. An important feature of the new building is the kitchen equipment which, with the exception of tea, coffee and milk supplying apparatus by Jackson Boilers, Ltd., was wholly supplied by the Jackson Electric Stove Co., Ltd. This equipment is in a de luxe all-enamelled finish, with the exception of the boiling pans and bain marie, which are nickel-plated. The equipment comprises the following: One 6-ft. hotcupboard, with switchgear attached (5.6 kW); a similar hotcupboard, but with a separate board; a 10-plate boiling table, with six 11½-in. plates (2.8 kW each), and four 8½-in. plates (2 kW each), total loading 24.8 kW, with switchgear attached to pot-rack; a grill, total loading 8.0 kW, with separate iron board; two steaming ovens (4.8 kW each), with switchboard attached; a two-pan fish range, each pan 18 in. by 18 in. (11.5 kW), complete with hood and draining rack and illuminated switchgear attached; a bain marie, of nickel-plated copper (8 kW), with switchgear fitted underneath the stand; two 25-gall. boiling pans, nickel-plated, each fitted with a solid copper soup container, also one for soup, with separate iron board, on 7-in. legs, total loading of each 9 kW; a 9.6-kW roasting oven, with illuminated switchgear attached; and a three-oven range, each oven 21 in. wide by 24 in. deep by 26 in. high, and each loaded to 4.8 kW, fitted with thermometers and with illuminated switchgear attached.

The British Association

The British Association for the Advancement of Science has issued the preliminary programme for its meeting in Aberdeen from September 5th to 12th—under the presidency of Sir James H. Jeans. This contains the necessary registration form and request for accommodation and a brief forecast of the proceedings. Professor F. G. Baily is the president of Section G.—Engineering, and his address will deal with "Sources of Cheap Electric Power." Among the subjects to be discussed by this section is the measurement and reduction of noise. Photo-electric cells will form the subject of a discussion in Section A.—Mathematical and Physical Sciences, the president of which is Professor H. M. Macdonald, O.B.E., F.R.S.

The E.A.W. Summer Programme

The summer programme of the Electrical Association for Women includes the following: May 8th, Visit to Messrs. W. T. Henley's Telegraph Works Co., Ltd., at Gravesend; May 10th, whist and bridge at the club room (20, Regent St., S.W.1) and talk on her tour in the East by Miss Gladys F. Sharp; May 15th, a new television system at the Ponders End works of Edison Swan Electric Co., Ltd.; May 30th, I.M.E.A. Convention, Liverpool; June 6th, visit to "Laughing Water," Cobham, Kent (Lord Darnley's estate) with all-electric restaurant and kitchens; June 14th, lecture by Mrs. Rees (Lever Bros.) on "The Washability of Modern Fabrics" with demonstrations on electric washing machine and ironer; July 3rd, lecture on "Summer Dishes," by Miss Dorothy Vaughan. Full particulars may be obtained from the Director, Electrical Association for Women, 20, Regent St., S.W.1. The Demonstrators' Circle is holding a series of fixtures at 7.30 p.m. in the Club Room. On May 7th a sketch entitled "A Travesty on the English Language" will be given; on May 14th Mrs. B. Swire will lecture on "Down the Danube to Roumania"; on May 28th Miss M. Partridge will talk on "Electro-magnetic Induction," with experiments; and on June 4th Miss Dorothy Vaughan will give a lecture on "The Demonstrator and a Refrigerator."

We regret that below one of the pictures on page 593 of our last issue we described the lady with Colonel R. E. Crompton as "Miss Crompton." Actually the photograph was of Mrs. Calvert.

Appointment Vacant

Assistant engineer in the Mains Department of Hastings Electricity Department.

(See our classified advertisements.)

Makers' Names Wanted

VORAX vacuum cleaner.
PIGMYLITE electric lighting set.
KUBEX electric oven.

Our Personal Column

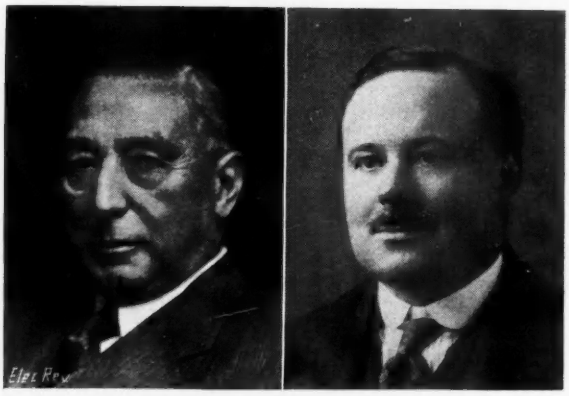
Electrical men are invited to keep readers of the "Electrical Review" posted concerning their movements

Lord Ashfield, who was unable to attend the annual meeting of the Electrical Industries Benevolent Institution on Friday last, owing to eye trouble, underwent an operation at the Middlesex Hospital on Sunday last, and we are glad to learn that his condition is satisfactory.

[Elliott & Fry
Mr. F. H. Corson

Mr. F. H. Corson, M.Inst.C.E., M.I.E.E., chief engineer and general manager of the Gloucester Electricity Department, was the guest of the staff and employés at a dinner and smoking concert held on April 20th to mark the completion of his twenty-five years' service with the Corporation. The gathering included seven members who were on the staff when Mr. Corson joined the Department in 1909. During the evening the chairman of the Electricity Committee, Ald. H. Harmer, presented Mr. Corson with a gold wrist watch on behalf of the staff and employés.

Lt.-Col. F. A. Cortez Leigh, who, as reported in our last issue, is shortly retiring from the position of electrical engineer to the London, Midland and Scottish Railway, after twenty-five years' service in that capacity, and that of electrical engineer to the former L. & N.W. Railway Co., received his engineering education at Owen's College, Victoria University, Manchester, and Finsbury Technical College. He was a pupil of the Brush Co. in 1890, and afterwards was engaged in the erection of power stations and arc lighting installations for this company, including the power stations at Worcester and Huddersfield. In 1895 he joined Messrs. Lacy & Sillar, consulting engineers, as a partner, the firm afterwards becoming Lacy, Sillar & Leigh. In the early days the firm acted as joint consulting engineers to the Lancashire Power Co. and the Yorkshire Power Co. with the late Mr. Parshall. In 1909 Col. Cortez Leigh was appointed chief electrical engineer to the L. & N.W. Railway, having previously acted as consulting engineer to that company. He was responsible for the design and erection of the Stonebridge Park power station and the electrification of the Euston and Watford and Broad Street and Richmond suburban services. He also negotiated large bulk supply agreements with the Manchester and Liverpool Corporations. In 1912 he became a lieutenant-colonel in the Royal Engineers, Signal Services, Territorial Force, and during the latter part of the war was in charge of the Haynes Park training depôt. On the formation of the L.M.S. Railway Co. in 1925 he was appointed chief electrical engineer in charge of electric traction, lighting and power, and he was responsible in 1930 for the electrification of the Manchester-Altrincham Railway and the extension of the electrified line from Barking to Upminster. He is a member of the Institutions of Electrical, Civil and Mechanical Engineers and the Institute of Transport. He is a director of the North Wales Power Co. and the Electricity Distribution of North Wales, Ltd., and a member of numerous committees dealing with transport matters. He recently visited America, Germany and Italy, on behalf of the L.M.S. Railway, to investigate railway electrification and the development of Diesel engines in these countries. The company will, for the present, continue his services in an advisory capacity and his representation of other L.M.S. interests.



[Basil, London
Lt.-Col. F. A. Cortez Leigh and his successor, Mr. C. E. Fairburn

Mr. C. E. Fairburn, who is at present with the English Electric Co., Ltd., will succeed Lt.-Col. Cortez Leigh as chief electrical engineer of the L.M.S. Railway, and will enter upon the duties on July 1st next. Mr. Fairburn received part of his earlier technical training in the locomotive works at Derby, and was afterwards a member of the staff of Siemens Dynamo Works, Ltd. During the war he served with the Royal Flying Corps, and, later, as experimental officer with the Royal Air Force. In 1919 he joined the English Electric Co., Ltd., where his work has been mainly connected with railway electrification projects both at home and abroad, and he became in 1931 chief engineer and manager of the Traction Department of that company.

Mr. L. V. Turner

Mr. L. V. Turner, A.M.I.E.E., the author of the article on "Boiling Plates," which appeared in our last issue, received his training with Messrs. Newtons, Ltd., Rotax, Ltd., and the Croydon Corporation electricity works. He has had control of a large assembly department at Messrs. Vickers, Ltd., and, after occupying various power station posts, was appointed to his present position of deputy borough electrical engineer in the Taunton Electricity Department in 1931. He has lectured for a number of years in electrical engineering at the Taunton Technical Institute.

Mr. R. H. Friend, A.M.I.E.E., manager of the Manchester office and textile engineer for Messrs. Siemens-Schuckert (Great Britain), Ltd., has been elected a fellow of the Textile Institute.

Mr. P. Nutter has been reappointed sole representative in the North-East Coast Area for the Macfarlane Engineering Co., Ltd. His address is 2, Princess Street, Newcastle-on-Tyne.

During the absence of **Major A. D. Pearce** in the United States, where he will represent the Amateur Fencing Association, his assistant, Mr. Kemp, will be in charge of the Birmingham depôt of B.E.N. Patents, Ltd. Major Pearce is returning on May 9th.

Mr. W. H. Keys has joined the Associated Equipment Co., Ltd., as municipal sales representative. He has been engaged for over twenty-five years in the sale of petrol and oil-engined vehicles and trolley-buses.

Mr. E. Ll. Ingram, chief engineer of the Bournemouth & Poole Electricity Supply Co., Ltd., is retiring at the end of June next, having held that position for thirty-six years. He served a mechanical engineering apprenticeship with Messrs. John Williams & Son, Ltd., of Cardiff, and joined the Brush Electrical Engineering Co., Ltd., under the late Mr. J. S. Raworth, in 1890. He was appointed station superintendent at Bournemouth in 1894, and went to Spain in 1897 for the Electricity Supply Co. of Spain, Ltd. In the following year he returned as chief engineer to the Bournemouth Co. He will not be severing his connection with the company, as he is remaining on the staff in an advisory capacity. Mr. Ingram is a member of the Institution of Electrical Engineers, and a past chairman of the Hampshire Sub-Centre. His successor as chief engineer is **Mr. R. C. Pilsbury,** B.Sc., A.M.I.E.E.

[Fox Studios, Bournemouth
Mr. E. Ll. Ingram

Mr. G. R. J. Parkinson, whose retirement as engineer and manager of the Midland Electric Corporation for Power Distri-

bution, Ltd., has already been announced in the ELECTRICAL REVIEW, was presented with an automatic radiogram at a meeting of the Midland Electric Circle on April 24th. In making the presentation on behalf of the Circle, Mr. T. R. Priest, the past-chairman, said that they regretted losing Mr. Parkinson in his capacity as engineer as he had been a good friend to the contractors, but they understood they would still have the benefit of his advice. Mr. Parkinson was the first engineer in the Midlands to call a meeting of contractors some years ago to put forward an assisted-wiring scheme, and had since depended upon them to carry out this and other wiring work. Mr. C. Best, of the Revo Electric Co., Ltd., added a tribute on behalf on the manufacturers.

Mr. G. Stirling Newall, D.L., J.P., joint managing director of Messrs. Turner & Newall, Ltd., and local chairman of its Northern subsidiary companies, and **Mr. H. A. Couves,** M.I.E.E. have been elected directors of the North-Eastern Electric Supply Co., Ltd. Mr. Couves served his apprenticeship with Messrs. John Stewart & Co., Ltd., at the Blackwall Iron Works, and received his electrical training at the works of Siemens Bros., Woolwich. He joined the staff of Messrs. Merz & McLellan in 1901, and in 1906 was appointed engineer of the Power Department of the Newcastle-upon-Tyne Electric Supply Co., Ltd., and subsidiary companies (now the North-Eastern Electric Supply Co.). Since 1926 he has been general manager of the company. He is chairman of the North-East England District Consultative Technical Committee of the Central Electricity Board, a member of the council of the Incorporated Association of Electric Power Companies, a member of the National and District Joint Industrial Councils for the Electricity Supply Industry, and of the National and District Joint Boards for the Electricity Supply Industry, and also of the Investigation Committee appointed under the Northumberland District (Coal Mines) Scheme of 1930. He is a member of the I.E.E., the Iron and Steel Institute, the Association of Mining Electrical Engineers, and the North-East Coast Institution of Engineers and Shipbuilders.

[*Elliott & Fry*

Mr. H. A. Couves

Mr. G. A. Vowles, who has been selected for the position of borough electrical engineer of Halifax, is forty-two years of age and received his education at the Bath Forum School, Bath. He served his apprenticeship under Mr. F. Teague, of the Bath Corporation Electricity Department, and has since been connected with various electricity undertakings, including the North-Eastern Electric Supply Co., Ltd., and Worcester and Stoke-on-Trent Corporations. His present position, which he has held for the past five years, is that of personal engineering assistant to Mr. J. N. Waite, M.I.E.E., city electrical engineer of Hull, and in recognition of his services in this capacity the Hull Electricity Committee, at its last meeting, decided to present him with a testimonial under the Corporation's seal.

Mr. G. A. Vowles

Sir John Cadman, G.C.M.G., chairman, Anglo-Persian Oil Co., has been elected president of the Institute of Fuel for the year 1934-35.

Mr. F. W. Crawter was the recipient last Thursday evening of a piece of London plate (1783), presented by the Council of the Institution of Electrical Engineers as a memento of his sixteen years' service (1917-1933) on the Membership Committee.

Mr. H. L. Kirby Johnson, managing director of the Martindale Electric Co., Ltd., had a narrow escape while at golf on Saturday last when a lightning discharge struck the course near the spot at which he was playing.

Obituary

Mr. W. A. Easter.—The death recently occurred, at the age of seventy-eight, of Mr. W. A. Easter, who was the founder of the business which is now carried on by the British Electric Co.

Mr. G. F. Simpson, partner in the firm of Mackie & Simpson, electrical engineers, of Edinburgh, who recently died, had been in business at that city for half a century.

Financial Section

New Companies, Returns of Share Capital, Debenture Charges, Reports of Electrical Companies, Dividend Changes, Transactions in Stocks and Shares

New Companies Registered

A. M. E. Sherwood, Ltd.—Private company. Registered April 7th. Capital, £100 in £1 shares. Objects: To carry on the business of manufacturers of and dealers in neon, luminous tubes and lighting apparatus and equipment, sign and electrical appliances of all kinds, accessories and fittings, &c. The first directors are: Mrs. A. M. E. Sherwood and J. M. Sherwood, both of 12, Charles Street, Holborn, E.C.1. Registered office: 12, Charles Street, Holborn, E.C.1.

Wiring Installations (Housing), Ltd.—Private company. Registered April 4th. Capital, £100 in £1 shares. Objects: To carry on the business of wiring contractors, electricians and mechanical engineers, &c. The first directors are: A. C. Henham, 102, Kynaston Avenue, Thornton Heath; and A. C. Metcalfe, 210, Parchmore Road, Thornton Heath. Registered office: 14/15, Coleman Street, E.C.4.

S.E.P., Ltd.—Private company. Registered March 26th. Capital, £100 in £1 shares. Objects: To acquire the business of an electrical appliance dealer carried on by Gilbert M. Owens, 9, Creek House, High Street, Kingston, Surrey, as "Southern Electrical Products," also to carry on the business of manufacturers of and dealers in radio apparatus, gramophones, television appliances, &c. The first director is G. Meredith Owens, 44, Lower Ham Road, Kingston, Surrey.

Blackburn Radio and Electrics, Ltd.—Private company. Registered March 31st. Capital, £750 in £1 shares. Objects: To construct and maintain wireless signal stations and all other stations, &c. The first directors are: J. E. Lynch and Mrs. Elizabeth Lynch, both of 18, Devonport Road, Blackburn. Registered office: 18, Devonport Road, Blackburn.

Baker's Selhurst Radio, Ltd.—Private company. Registered March 31st. Capital, £1,000 in £1 shares. Objects: To carry on the business of manufacturers of wireless loud speakers and apparatus, &c. The subscribers are: A. Baker and Mrs. Alice Baker, both of 89, Selhurst Road, South Norwood, S.E.25; and Mrs. Gladys J. Still, Metcalfe Farm, Hedgerley, Bucks.

Neonrent, Ltd.—Private company. Registered April 7th. Capital, £100 in £1 shares. Objects: To carry on the business of hirers, purchasers, sellers, renters, installers, maintainers, cleaners, repairers or dealers in neon and luminous tubes, and lighting apparatus and equipment, and electrical appliances of all kinds, &c. The first directors are: W. Stratton, 116, Shakespeare Road, Stoke Newington, N.16, and Mrs. A. M. E. Sherwood, 12, Charles Street, Holborn, E.C.1. Registered office: 12, Charles Street, Holborn, E.C.1.

Philip Knowles, Ltd.—Private company. Registered April 18th. Capital, £100 in £1 shares. Objects: To carry on the business of wholesalers, factors and distributors of and agents for all kinds of electrical and wireless components and accessories, &c. The subscribers are: Charles R. Olley, 15, Rona Road, Hampstead, N.W.3, Arthur J. P. Knowles, 4, Elms Road, Clapham, S.W.4. Registered office: 84/6, Chancery Lane, W.C.

Rex Radio, Ltd.—Private company. Registered April 24th. Capital, £250 in £1 shares. Objects: To acquire the business now carried on at 242, Regent Road, Salford, as the "Rex Radio Co.," and to carry on the business of radio dealers in all its branches, &c. The permanent directors are: Mrs. Esther Hyman and H. Hyman, both of 384, Bury New Road, Salford. Registered office: 397, Stockport Road, Longsight, Manchester, 13.

"T. X." Products Co., Ltd.—Private company. Registered April 23rd. Capital, £5,000 in £1 shares. Objects: To carry on the business of manufacturers, importers and exporters of and wholesale and retail dealers in electrical and mechanical appliances, wireless apparatus, &c. The directors are: R. V. Langbart and Elsie E. Langbart, both of 407, Lordship Lane, N.17. Registered office: 32, Queensway, Ponders End, Mdx.

Roberne Electrical Supplies Co., Ltd.—Private company. Registered April 23rd. Capital, £1,000 in £1 shares. Objects: To acquire the business carried on at "Salvete," Doric Avenue, Southborough, Kent, by Rowland S. Bernard as Roberne Electrical Supplies Company, and to carry on the business of manufacturers and wholesalers of radio receiving sets, electrical appliances, &c. The directors are: H. G. Robinson, "Elmcroft," 15, Recreation Road, S.E.26; and R. S. Bernard, "Sal-

vete," Doric Avenue, Southborough, Kent. Secretary: Doris M. Bernard. Registered office: "Salvete," Doric Avenue, Southborough.

Partridge Wilson & Co., Ltd.—Private company. Registered April 20th. Capital, £25,000 in 15,000 shares of £1 each and 40,000 shares of 5s. each. Objects: To carry on the business of electrical engineers, manufacturers, designers, hirers and repairers of electrical and wireless apparatus, manufacturers of and dealers in motor vans, cars, &c. The directors are: H. G. A. R. Wilson (permanent director and chairman) and Mrs. E. M. Wilson, both of Springwell House, Glebe Road, Leicester. Secretary: Rachael M. Taylor, 272, Aylestone Road, Leicester. Registered office: Davenset Works, Evington Valley Road, Leicester.

Gallagher & Co. (Electricians), Ltd.—Private company. Registered April 25th. Capital, £1,000 in £1 shares. Objects: To carry on the business of electricians, electrical, wireless, mechanical, motor, telephone, heating, ventilating and general engineers, &c. The subscribers are: J. Gallagher, electrical engineer, and Mrs. V. Gallagher, both of 842, Barnsley Road, Sheffield. Secretary: J. Gallagher.

Pain & Lungley, Ltd.—Private company. Registered April 25th. Capital, £600 in £1 shares. Objects: To carry on the business of electrical, radio, gramophone, engineers, &c. The permanent directors are: S. T. Pain, 65, Ballards Way, South Croydon; and C. J. Lungley, 4, Howard Road, South Norwood. Registered office: 155, Portland Road, S.E.28.

Perkins Radio Service, Ltd.—Private company. Registered April 26th. Capital, £2,000 in £1 shares. Objects: To acquire the business of a wireless and electrical dealer and engineer, carried on by A. C. Perkins, at Stoke Road, Guildford. The subscribers are: A. C. Perkins, "Malvernia," Shepherds Lane, Guildford, and two others. Secretary: Alfred C. Perkins.

Returns of Electrical Companies

Electric Construction Co., Ltd.—Satisfaction to the further extent of £100, on March 31st, 1934, of 4 per cent. 1st mortgage debenture stock, covered by trust deed, dated December 16th, 1897, and registered September 10th, 1908, securing £200,000.

Altrincham Electric Supply, Ltd.—Satisfaction to the extent of £6,250 on April 3rd of mortgage dated December 23rd, 1925, and registered December 29th, 1925.

Pauline Radio, Ltd.—Satisfaction to the extent of £1,000 on March 20th of debenture dated May 18th, 1933, and registered May 22nd, 1933.

Debenture dated April 10th to secure £1,400, charged on the company's property, present and future, including uncalled capital. Holder: H. Pyett, Norwood, Swanmore Road, Bournemouth.

Concordia Electric Safety Lamp Co., Ltd.—Particulars filed of £40,000 debentures authorised March 19th charged on the company's undertaking and property, including uncalled capital, except freehold and leasehold property and machinery for manufacturing the company's products and usually installed on such property. The amount of the present issue is £6,600.

Satisfaction to the extent of £2,676 4s. 10d. (being balance owing) on April 9th, 1934, of debenture dated November 21st, 1932, and registered December 3rd, 1932. (According to the register of mortgages the debenture registered December 3rd, 1932, originally secured all moneys due to bank.)

Kingsland Engineering Co., Ltd.—Deed of variation dated April 9th of debentures issued January 9th, 1930, securing £400, charged on the company's undertaking and property, including uncalled capital. Holder: J. C. McCollin, 108, Kingsland Road, Dalston.

"New Era" Time & Telephone Systems, Ltd.—The nominal capital has been increased by the addition of £900 beyond the registered capital of £100. The additional capital is divided into 18,000 ordinary shares of 1s.

Standard Switchgear, Ltd.—The nominal capital has been increased by the addition of £1,900 in £1 ordinary shares beyond the registered capital of £3,100.

Lancashire Telephone Systems, Ltd.—Issue on September 28th, 1933, of £800 debentures, part of a series already registered. (Particulars of issue filed April 13th, 1934.)

Edison Bell (International), Ltd.—Issue on April 11th, 1934, of £423 15s. debentures, part of a series already registered.

Continental Hydro Electric Co., Ltd.—Capital, £20,000 in £1 shares. Return dated November 3rd, 1933. 5,000 shares taken up. £5,000 paid. Mortgages and charges, nil.

Maidstone Radio Central Exchange, Ltd.—Capital, £5,000 in 4,500 preference shares of £1 and 10,000 ordinary shares of 1s. Return dated November 9th, 1933. All shares taken up. £4,000 7s. paid on 4,000 preference and seven ordinary shares. £999 13s. considered as paid on 500 preference and 9,993 ordinary shares. Mortgages and charges, nil.

Power Products, Ltd.—Capital, £12,500 in £1 shares. Return dated November 7th, 1933. 12,500 shares taken up. £3,125 paid (5s. per share). Mortgages and charges, nil.

McGoff & Vickers, Ltd.—Capital, £2,000 in £1 shares. Return dated November 30th, 1933. 1,750 shares taken up. £1,750 paid. Mortgages and charges, nil.

Robinson & Hands Electric Co., Ltd.—Capital, £5,000 in 4,980 preference and 20 ordinary shares of £1. Return dated December 27th, 1933. 4,232 preference and 20 ordinary shares taken up. £4,252 paid. Mortgages and charges, nil.

C.C.A. (Central Cables & Accessories), Ltd.—Debenture dated April 16th, 1934, to secure £300, charged on the company's undertaking and property, present and future, including uncalled capital. Holder: Mrs. H. Halfter, 112, Perry Vale, Forest Hill, S.E.23.

Manuus Manufacturing Co., Ltd.—Satisfaction in full on April 12th, 1934, of charge dated February 9th, 1933, and registered February 15th, 1933. (According to the register of mortgages, the charge registered February 15th, 1933, originally secured £1,400.)

A. E. Shearing, Ltd.—W. E. Thorpe, 5, John Street, Bedford Row, W.C.1, was appointed receiver and manager on April 20th, 1934, under powers contained in debenture dated June 1st, 1933.

High Vacuum Valve Co., Ltd.—The nominal capital has been increased by the addition of £5,000 in £1 ordinary shares beyond the registered capital of £20,000.

Watson & Sons (Electro-Medical), Ltd.—The nominal capital has been increased by the addition of £1 beyond the registered capital of £52,000 in the form of one "B" ordinary share.

A. E. Rising, Ltd.—Debenture, dated April 11th, 1934, to secure £1,000, charged on the company's property, present and future, including uncalled capital. Holders: Westminster Bank, Ltd.

Magneto Repairs, Lighting & Ignition Co., Ltd.—Capital, £100 in £1 shares. Return dated April 14th, 1933 (filed February 28, 1934). All shares taken up. £100 paid. Mortgages and charges, nil.

Relay Broadcast Operating Co., Ltd.—Capital, £500 in £1 shares. Return dated December 31st, 1933 (filed March 2nd, 1934). All shares taken up. £490 paid, £10 calls unpaid. Mortgages and charges, nil.

Electrical Manufacturing & Plating Co., Ltd.—Capital, £300 in £1 shares. Return dated December 31st, 1933. All shares taken up. £300 considered as paid. Mortgages and charges, nil.

Victoria Radio Co., Ltd.—Capital, £100 in £1 shares. Return dated December 29th, 1933. All shares taken up. £100 paid. Mortgages and charges, nil.

Electroway Heaters, Ltd.—Capital, £2,000 in £1 shares. Return dated December 31st, 1932 (filed February 21st, 1933). 1,098 shares taken up. £1,098 paid. Mortgages and charges, nil. On February 16th, 1934, a further 210 shares were allotted, payable in cash, and fully called up.

Electrical Appliances (Blackpool), Ltd.—W. B. Haworth, 35, Cokson Street, Blackpool, ceased to act as receiver and manager on February 19th, 1934. (Notice filed April 23rd.)

Collins Brown & Co., Ltd.—G. H. D. Soames, 9, Laurence Pountney Hill, E.C.4, ceased to act as receiver on April 24th, 1934.

Clarendon Radio, Ltd.—The nominal capital has been increased by the addition of £1,900 in £1 ordinary shares beyond the registered capital of £100.

City Notes

Ericsson Telephones, Ltd., held its annual meeting on April 26th, when Col. Sir Harold A. Wernher (chairman), who presided, said that their activities now included telephonic apparatus, wireless headphones, police signalling systems, cellulose enamels and varnishes, electric totalisators, metal parts for the motor and kindred trades, inter-communication telephone systems on rental terms, cabinet work and Stock Exchange price displays. With the exception of totalisators, the volume of business done had been well maintained in all these departments. Good progress was made during the year in the development of the telephone system of Great Britain. The total number of stations increased by nearly 4 per cent. There were now more than 1,300 automatic telephone exchanges in use, which was approximately one-quarter of the total, and the conversion of the remaining manual exchanges was proceeding apace. The public system comprised about 2,140,000 telephones, and the number of calls put through in 1933 reached a total of 1,500,000,000. Important developments last year included the opening by the Prime Minister of the new Research Station at Dollis Hill, the introduction of the "on demand" trunk service, and the inauguration of the group telephone system. The agreement between the Post Office and the British manufacturers of automatic telephone exchange plant had been renewed for a further period of five years. They were a party to this, which provided for the bulk supply of telephone exchange material, the pooling of patents, and allowed full and free collaboration between all the parties on matters appertaining to research, standardisation of designs, and circuits and improvements. The position with regard to Post Office stores apparatus, however, was not so satisfactory. During the past few years this business had been subjected to severe competition, and most prices were at an uneconomic level. They hoped that negotiations which were now proceeding with the Post Office would be concluded so that the measures of rationalisation already introduced with exchange equipment would be fully achieved. Since the Appeal Court decision in December, 1932, the totalisator business had been at a standstill. Export business at last showed some signs of revival, but much leeway had still to be made up. So far as they were concerned the prospects for the current year were very encouraging.

The Electric Supply Corporation, Ltd., held its annual meeting on April 30th, when Mr. K. A. Scott-Moncrieff (chairman), who presided, said that at the end of the year under review 15,230 consumers were supplied by their own and their subsidiary companies' undertakings, which was an increase of 14 per cent. The output of 17,000,000 kWh was 40 per cent. over the 1932 figure. For some years now they had been gradually disposing of their old undertakings. When the company started operating the supply of electricity was confined to small isolated areas and rural supplies were practically unknown. Since then there had been a great change, and several of their undertakings were, as in the case of Chelmsford, surrounded by the area of a larger one. This position had been accentuated by the development of rural supplies, and the tendency to consolidate scattered areas had made their small isolated undertakings of greater value to their neighbours than to themselves; they had consequently been able to dispose of some of them upon satisfactory terms. They had also to consider the possibility of purchase by the local authorities. On the other hand, they had acquired 300 sq. miles of area in Sussex, which

they were developing rapidly. Their policy, therefore, was to invest in a similar way the proceeds of the sales. Regarding the outlook for the current year, they would have to face the loss of profits from Petersfield and Chelmsford. There was also the small undertaking in Totnes, which would probably be acquired by the Torquay Corporation during the year. Moreover, they had to provide a dividend on an increased number of ordinary shares. On the other hand, they could look confidently to improved returns from the capital already invested in the newer undertakings and from the investment of additional funds in a similar manner. They had also a substantial carry-forward available if development should be slower than they expected. He hoped, therefore, that the dividend for 1934 would be but slightly reduced, with a good prospect of coming up to the old figure before long.

Pye Radio, Ltd.—Presiding at the annual meeting on May 1st Sir Thomas A. Polson (chairman) referred to the fall in profits and said that following preliminary investigations, they decided to form a representative body of their dealers, known as the Pye National Advisory Council, composed of fifty dealers in all parts of the country. Investigation of the points they put before the company resulted in a complete change of their distribution policy. The company had given notice that as from July 1st last they would, in future, deal direct only with their own regularly appointed service agents and selected radio dealers throughout the country. As they had anticipated, from the moment they changed their policy, they had great difficulty in selling their existing models to their retailers, owing to the liquidation of stocks by wholesalers who would no longer be handling their products. A new range of sets was being manufactured, but they knew that the speeding up of output, before they were satisfied that these new sets would be able to maintain the reputation and prestige of the company, would be courting disaster. Thus, they undoubtedly lost a good deal of business during this period. Despite these happenings they felt that they had done the right thing. Abuses under the former methods of distribution had been stopped. Further technical progress had been made and on the commercial side more aggressive marketing methods had been adopted which should develop an all-the-year-round volume of business.

The Calcutta Electric Supply Corporation, Ltd., reports a gross revenue for 1933 of £1,042,869, as compared with £1,081,573 in the preceding year, and a net revenue of £408,913, against £440,988. To this is added £35,166 brought in, and after deducting debenture interest, &c., it is proposed to pay a final ordinary dividend of 7 per cent., making 12 per cent. (same), and to pay a bonus of 2d. per share on the ordinary shares (same), leaving £31,705 to be carried forward. The sales of electricity increased from 185,134,324 kWh to 190,151,448 kWh. The report states that in spite of the continuing depression sales improved for both power and domestic purposes. Successive reductions in rates for industrial loads were made in November, 1932, and in June, 1933, and a certain amount of revenue from domestic consumers, which would ordinarily have come into these accounts, is carried forward into 1934 by reason of a change of dates in the rendering of bills. The deduction for income-tax from the dividend and bonus on the ordinary shares is at 2s. 3d. It is proposed to grant to the staff in India a bonus equivalent to 2 per cent. of the Indian net profit, in respect of approved service actually rendered in 1933. Meeting: May 7th.

The North Somerset Electric Supply Co., Ltd.—Presiding at the annual meeting held on April 25th, Mr. J. H. Woodington (chairman) referred to the continued success of the domestic two-part tariff, and said that over 30 per cent. of their domestic consumers were buying electricity under this tariff. The directors had decided to provide further capital to meet the continued growth of the company by issuing 100,000 additional ordinary shares at a premium. These shares would be offered to holders of ordinary shares in proportion to their holdings, and a notice calling a meeting to pass the necessary resolution would be issued shortly. Mr. F. Christy said that they had extended their 33,000-V line to Langport. Their maximum load last year was approximately 5,000 kW, and they purchased about 15¼ million kWh, an increase of 15 per cent. on the previous year. Over 380 electric cookers were connected to the mains last year, and the total now in use was well over 1,000. This, coupled with the increasing number of industrial concerns electrical power, was encouraging.

The Société Financière de Transports et Entreprises Industrielles ("Sofina") reports a gross income for 1933 of Belgian fr. 106,970,988, as compared with fr. 110,400,286 in the preceding year. The net earnings, including fr. 10,040,971 brought in, were fr. 94,921,258 (fr. 94,415,971). There was an almost general increase in the output of electricity as compared with 1932. In Spain sales fell slightly, but they had increased continually since 1928, and the setback in 1933 was probably due to the protracted strikes that occurred in the course of the year. In some cases railway electrification has contributed to the increase, but the main cause of the expansion was the extra sales for domestic uses.

The Western Union Telegraph Co. reports gross operating revenues for 1933 of $82,308,606, as compared with $83,013,712 in the preceding year. The net income was $4,364,882, as against a deficit of $842,595. A special dividend of $1,162,545, received from the American District Telegraph Co. (N.J.) is included in the income for 1933. To the net income is added $89,031,149 brought in, making $93,165,753, which is carried forward. At December 31st last the Western Union system comprised 217,828 miles of pole lines, 3,959 miles of landline cable, 1,864,643 miles of wire, 30,778 nautical miles of ocean cable, and 21,261 telegraph offices, and, in addition, over 16,000 telegraph agency stations.

The Young Accumulator Co. (1929), Ltd.—Presiding at the annual meeting on May 1st, Mr. C. H. Robottom said that the special qualities of Young accumulators made them particularly suitable for Diesel engined vehicles, and an increasing business was being done in that rapidly growing market. The reduction in the horse-power tax should materially assist their sales in the coming year, although its actual effect would not be fully felt until next year. The field was vast, and they were confident that they could obtain a bigger share, which the proposed extensions would enable them to supply.

The Canadian General Electric Co. reports a net profit of $635,175 for 1933, after deducting expenses, reserves, taxes and depreciation. The previous year's net profit was $1,165,661. Sales of large apparatus were considerably reduced during the year, business being made up largely of the sale of small apparatus and household appliances. A total of $3.25 per share was paid on the common stock for the year. Dividend disbursements exceeded net earnings by $577,613, which amount was charged against surplus, leaving a balance of $6,186,805 on this account.

The Ebonite Container Co., Ltd., held its annual meeting on May 1st, when Mr. E. B. Ridsel (chairman), who presided, said that sales continued to expand, although the price for moulded ebonite containers was still very keenly cut. On the other hand, several new and profitable lines had been added to the range of manufactures. The sales for the first three months of the current year showed an increase over the corresponding period of 1933.

The St. Austell & District Electric Lighting & Power Co., Ltd., reports a profit of £3,512 for 1933, after providing for expenses and interest and depreciation, which with £3,324 brought in makes £6,836. It is proposed to pay a final ordinary dividend of 5 per cent., making 10 per cent., and to carry forward £3,288.

The London Electric Wire Co. & Smiths, Ltd., reports a net profit for 1933 of £64,700, as against £60,562 in 1932. It is proposed to pay a final ordinary dividend of 3½ per cent., maintaining the distribution for the year at 5 per cent., and to carry forward £19,628 (against £19,132 brought in). The report states that throughout the greater part of the year trading conditions continued to be difficult, but towards the end of the year there was some improvement, which was being maintained. Meeting: May 4th.

The Ever Ready Co. (Great Britain), Ltd., reports that the accounts for the year ended March 31st last show, subject to completion of audit, a net profit of £396,923 (including a profit of £16,984 on the realisation of investments), as compared with £343,473 in the preceding year. It is proposed to pay a final dividend of 25 per cent. on the old ordinary shares, making 35 per cent. for the year (same), 25 per cent. on 440,000 new ordinary shares, and 17½ per cent. on 120,000 new ordinary shares. Reserves and carry forward total £1,239,344, as against £771,692 last year.

The Telephone Manufacturing Co., Ltd., reports a profit for 1933 of £16,168 (against £24,631 for 1932). The dividend is 2½ per cent. less tax (unchanged), and £9,688 is carried forward. The report states that the turnover increased but prices secured for contracts were unremunerative. Steps have been taken, in conjunction with other telephone manufacturers, to introduce a measure of rationalisation into the industry. Meeting: May 7th.

The Melbourne Electric Supply Co., Ltd., is to redeem on November 1st the whole of its 5 per cent. redeemable first mortgage debenture stock at 105 per cent.

Glenfield & Kennedy, Ltd., have declared a final ordinary dividend of 5 per cent., making 7 per cent. for the year, against 4 per cent. for the preceding year.

S. Smith & Sons (Motor Accessories), Ltd., have announced an interim dividend of 5 per cent. on the preferred ordinary shares (unchanged).

The East African Power & Lighting Co., Ltd., has announced a final dividend of 4 per cent. on the old ordinary shares, maintaining the distribution for the year at 7 per cent.

Stocks and Shares

TUESDAY EVENING.

MONETARY conditions remain easy in the City, and the prices of gilt-edged stocks are tolerably well-maintained. It is necessary to say "tolerably," because every now and then a slight decline occurs, which, although followed as a rule by recovery, is usually rather greater in extent than the latter. From this it looks as though industry were beginning to call for more capital than it has hitherto demanded, and that the amount of money standing ready for investment in purely gilt-edged stocks is at length feeling the effects of expansion in trade. The tendency at present is so slight, however, as to be worth scarcely more than this passing reference. So far from its having had any influence upon the prices of the gilt-edged stocks quoted here, the only change in the group given in our tables is a rise of 1 in Central Electricity 5 per cent. stock of 1950-1970, taking the price to 116. The 3 per cent. holds its improvement at 99. Home Railway prior charge stocks are equally steady. The remission of 6d. in the income tax makes a sensible contribution to the relief felt by industry, and acts, in itself, as a corrective to the disposition just noted. It deserves to be mentioned, however, that capital is making an exchange increasingly every day from stocks to which no definite dates of redemption are attached into those which carry a fixed date, and which offer, therefore, less risk of capital depreciation than is commonly regarded as possible in the cases of stocks that are either irredeemable, or virtually so.

Cables and Wireless

The Stock Exchange was closed on the Tuesday in this week for the usual May-Day holiday. Upon re-opening, a new cable office became available for sending messages between the Stock Exchanges of London and New York. Intimation of this development has already been given here, and reference was made, a fortnight ago, to the speed at which the

newcomer has already succeeded in sending transatlantic cables. It is not to be expected that the latest development will have much immediate effect upon the monthly traffics of Cables and Wireless, but if business in American stocks and shares were to revive, the combine would undoubtedly stand to benefit considerably. An increase of Cables & Wireless facilities is in contemplation in regard to South African traffic. A good deal is being done nowadays between the Stock Exchanges of London and Johannesburg. Of this traffic, Cables & Wireless anticipates getting a reasonable share. The prices of the stocks are dull. The preference has gone back to 73, and both the ordinary issues are lower, these declines reflecting the recent disappointment felt with the decision of the board to pay no more than a half-year's dividend on account of the accumulated arrears.

Marconi Marines are better at 32s. 6d., and Globe ordinary strengthened to 10½. American Telephone & Telegraph shares have receded to 117½.

Home Electricity Shares

Electric Supply Corporation ordinary shares are still quoted cum the bonus, and the middle price is 78s. 9d. At the meeting the other day the chairman pointed out that the Petersfield & Chelmsford undertakings is being acquired by the County of London Electric, and that there is a possibility of the Totnes Company being taken over by the Torquay Corporation. These changes may mean a diminution in the profits, but though the dividend may be reduced from the 11 per cent. that is at present being paid, the bonus issue, now declared, will probably serve to maintain the price of the shares. There is also, of course, a reasonable expectation of the dividend being restored to 11 per cent., even if it had to be cut for a short time. The meeting to give effect to the bonus which the company suggests will be held on May 22nd. Price fluctuations in this market are negligible. Hendon shares are 1/8 better at 56s. 3d. In the foreign group, Tokyo Electric sixes are 6 points lower at 74. Amongst Colinials, a further rise of 1/8 has lifted the Victoria Falls ordinary to 6 7/8. Sofina, the well-known Belgian financial and industrial company, has declared a dividend of 80 per cent., although the income is lower than that of 1932. The report is interesting, as showing an almost general increase in the output of electrical energy in Belgium. Sales in Spain have decreased slightly. Mention is made of the advance in sales of current for domestic use, and also of railway electrification on the Continent.

Manufacturing and Equipment

The Telephone Manufacturing Company stated, in its recently issued report, that steps had been taken in conjunction with other telephone manufacturers to introduce some measure of rationalisation into the telephone industry. Discussions with the Post Office are in progress. Until something definite results from this no details can be published. The price of the shares is about 3s., and Telephone Rentals at 7s. 9d. show a small decline. Johnson & Phillips have risen to 22s. 6d. upon consideration of the figures to which attention was directed here last week. Associated Electrical Industries ordinary shares eased off to 17s. 9d. on selling from New York. Ever-Ready shares are better at 30s., as a reflection of the report, and India-Rubber preferred at 17s. 6d. show a gain of 2s. 6d. by reason of the offer that has been made to the company. Enfield Rolling Mills are a little better at 35s. 6d. Crompton Parkinsons hardened to 25s. 6d. English Electric ordinary continue dull, going back to 6s. 3d., but the preference hold their improvement at 10s. Lively dealings in Electric & Musical Industries ordinary shares raised the price to 30s. 6d. General Electric preference, with a rise of 1s. 9d. to 32s. 6d., bear witness to the pressure of demand for gilt-edged shares of this nature.

"Earning Capacity"

Something of a feature during the past week or so has been the way in which America has been selling back to this country the shares of British industrial undertakings which she—America—bought some time ago during her boom time. Probably it will not be remembered, owing to lapse of time, how attention was drawn here to the fact that the Americans were buying industrial shares at prices which seemed, to sober folk in this country, absurdly high. By way of excuse, the American argument maintained that investment should look, not at what a company is doing at one particular period, but at what is its earning power—a treacherous contention which landed the Americans in huge losses of capital. Owing partly to the regularisation of the dollar exchange share in British companies which were sold to America are gradually coming back to these shores, where the demand for industrial investments is so considerable that there is a danger, perhaps, of optimism paying too much for prospects.

Miscellaneous Matters

The Rubber Market has taken on a fresh lease of life, owing to the publication of restriction proposals that seem to be workable and beneficial. Business has developed on active lines, and a very considerable turnover of shares has resulted in prices showing a majority of gains. The iron and steel market is also better, with Vickers, and some of the other leading issues in this group, displaying noticeable strength. Ebonite Containers are steady at 6s. 3d. on the dividend announcement. The various dollar stocks and shares are somewhat subdued.

Share List of Electrical Companies

	Nom.	Dividend. 1932.	Dividend. 1933.	Price. Apl. 30.	Rise or Fall	Yield. p.c. £ s. d.
Home Electricity Companies						
Bournemouth and Poole	1	15	15	77/6	—	3 17 2
Brompton Ordinary	1	7	7	34/6	—	4 1 2
Charing Cross Ordinary	1	7	7	35/6	—	3 19 0
Chelsea	1	7	7	34/6	—	4 1 2
City of London	1	7½	7½	37/-	—	4 1 1
Clyde Valley	1	7	7	42/6	—	3 5 8
County of London	1	10½	10½	59/6	—	3 11 0
Edmundson's 7% Pref.	1	7	7	34/-	—	4 2 4
Elec. Dis. Yorkshire	1	9	9	48/9	—	3 13 9
Elec. Supply Corporation	1	11	11	78/9	—	2 15 8
Kensington Ordinary	1	7	7	35/-	—	4 0 0
Lancs Light and Power	1	7	7½	38/9	—	3 17 4
London Electric	1	7	7	35/6	—	3 19 0
Metropolitan	1	10	10	53/-	—	3 15 6
Midland Counties	1	7	7	38/9	—	3 12 0
Mid. Elec. Power	1	8	8	42/6	—	3 15 3
North Eastern Electric Ordinary	1	6	6	34/-	−1/-	3 10 7
Do. 7% Pref.	1	7	7	35/-	—	4 0 0
Northampton	1	10	10	56/3	—	3 11 3
Notting Hill 6% Pref.	10	6	6	13½	—	4 8 11
North Met. Elec. Ordinary	1	10	10	63/9	—	3 2 10
Do. do. 6% Pref.	1	6	6	31/6	—	3 16 2
St. James' and Pall Mall	1	7	7½	36/6	—	4 3 4
Scottish Power	1	8	8	2 1/8	—	3 17 8
South London	1	7	7	37/-	—	3 15 9
Westminster Ordinary	1	7	7	35/-	—	4 0 0
Whitehall Elec. Invst. 7½% Pref.	1	7½	7½	22/-	—	6 16 4
Yorkshire Elec.	1	8	8	49/6	—	3 4 9
Public Boards.		1931.	1932.			
Central Electricity, 1950–70	Stock	5	5	116	+1	4 6 2
Do. 1955–75	„	5	5	116	—	4 6 2
Do. 1951–73	„	4½	4½	111	—	4 1 1
Do. 1963–93	„	—	3½	99	-	3 10 8
London & Home Counties, 1955–75	„	4½	4½	110	—	4 1 10
London Passenger Transport, A	„	—	4½	118½	—	3 16 0
Do. do. B	„	—	5	120½	—	4 3 0
Do. do. C	„	—	—	79½	—	—
West Midlands Joint Elec. 1948–68	„	—	5	114	—	4 7 9
Telegraph and Telephones.						
American Tel. & Tel.	$100	9	9	117½	−2½	7 13 3
Anglo-Am. Tel. Pref.	Stock	6	6	114½	+1	5 4 9
Do. Def.	„	1½	1½	28	—	5 7 2
Cables & Wireless 5½% Pref.	„	2¾	2¾	73	−½	3 15 4
Do. A. 7½% Ord.	,	Nil	Nil	21½	−1	—
Do. B. Ord.	„	Nil	Nil	9¾	−½	—
Globe Tel. and T. Ord.	10	Nil	2½	10½	+½	2 8 9
Do. do. Pref.	10	6	6	12¾	—	4 13 4
Great Northern Tel.	10	20	20	38½	—	5 4 7
Marconi-Marine	1	10	7½	32/6	+6d.	4 12 4
Oriental Telephone Ord.	1	12	12	3½	—	*3 16 10
Home and Foreign Trams, Etc.						
Anglo-Arg. Trams First Pref.	5	Nil	Nil	2/-	—	—
Do. do. 2nd Pref.	5	Nil	Nil	1/6	—	—
Do. do. 5% Deb.	Stock	Nil	Nil	6	—	—
British Electric Traction Df. Ord.	„	5	5	680	−10	—
Do. do. Pref. Ord.	„	8	8	157½	—	5 1 7
Brazil Traction	100	—	—	10½	−½	—
Brit. Columbia Elec. Rly. Pfc.	Stock	5	5	105	+1½	4 15 3
Mexico Trams, 5% Bonds	—	5	5	24½	+5	20 8 0
Mexican Light Common	100	Nil	Nil	8	—	—
Do. 7% Pref.	100	7	7	11	—	—
Do. 1st Bonds	—	5	5	49½	—	10 10 6
Victoria Falls Ord.	1	15	20	6 7/8	+ 1/8	3 4 9
Yorkshire (West Riding)	1	2½	5	1 1/8	—	4 14 1
Manufacturing Companies.						
Assoc. Elec. Ord.	1	4	3	17/9	−9d.	3 7 7
Do. Pref.	1	8	8	32/6	—	4 18 6
Babcock & Wilcox	1	9	6	42/6	—	2 16 6
British Aluminium Ord.	1	5	5	29/-	—	3 9 0
British Insulated Ord.	1	15	15	68/9	—	4 7 3
Brush Ord.	Stock	Nil	Nil	40	—	—
Callender's	1	15	15	58/9	—	5 2 0
Do. 6½% Pref.	1	6½	6½	30/9	—	4 4 6
Crompton Parkinson Ord.	5/-	22½	12½	25/6	+2/-	—
Do. 8% Pref.	1	8	8	32/6	—	4 18 6
Edison-Swan 1st Pref.	1	7½	7½	24/6	—	6 2 5
Do. 5% Deb.	Stock	5	5	102½	—	4 17 7
Electric Construction	1	Nil	Nil	13/9	—	—
Enfield Cable Ord.	1	25	25	62/6	—	4 12 7
English Electric	1	Nil	Nil	6/3	−1/8	—
Do. do. Pref.	1	Nil	Nil	10/-	—	—
Ever Ready	5/-	35	35	30/-	+6d.	5 16 8
Ferranti Pref.	1	7	7	26/-	—	5 7 9
G.E.C. Pref.	1	6½	6½	32/6	+1/9	4 0 0
Do. Ord.	1	8	8	42/6	—	3 15 1
Henley's	1	30	30	6	—	4 17 10
Do. 4½% Pref.	5	4½	4½	5½	—	4 5 9
India-Rubber Preferred	1	—	—	17/6	+½	—
Johnson & Phillips	1	5	5	22/6	+6d.	4 9 0
Siemens Ord.	1	7½	6½	18/9	—	—
Telegraph Construction	£1	Nil	Nil	23/9	—	—

*Dividends paid free of Income Tax.

Published Specifications

Compiled expressly for this journal by a firm of chartered patent agents. The numbers in parenthesis are those under which the specifications will be printed and abridged and all subsequent proceedings taken.

1931

20638. "Electrical insulators." H. Rost. September 29th, 1932. (408225.)

1932

17637. "Automatic frequency regulation of alternating current supplies." General Electric Co., Ltd., and J. W. Gibson. June 22nd, 1932. (408202.)

18513. "Electrical conductors." Rockbestos Products Corporation. July 11th, 1931. (408226.)

18859. "Vacuum electric tube devices and circuit arrangements therefor." E. Y. Robinson and Associated Electrical Industries, Ltd. July 4th, 1932. (Cognate application 8217/33.) (408256.)

19105. "Mechanical interlocks for electrical switchgear." General Electric Co., Ltd., and F. Booker. July 6th, 1932. (408274.)

21975. "Electric heating or drying apparatus." National Electric Heating Co., Inc. February 5th, 1932. (408296.)

21989. "Braun tube." Dr. K. Schlesinger. August 10th, 1931. (408297.)

24631. Two-way telephone and like electrical systems." Marconi's Wireless Telegraph Co., Ltd., and F. M. G. Murphy. September 3rd, 1932. (408300.)

24897. "Electric contacts." G. P. Dennis. September 7th, 1932. (408301.)

27110. "Switching arrangement in automatic and semi-automatic telephone systems." Telefonaktiebolaget L. M. Ericsson. September 29th, 1931. (408261.)

27171. "Telephone systems." J. P. Lowe. September 30th, 1932. (408264.)

27176. "Burglar-alarm systems." H. J. Tibbles, H. C. Tibbles, and Rely-A-Bell Burglar & Fire Alarm Co., Ltd. September 30th, 1932. (Cognate application 20955/33.) (408239.)

27207. "Radio direction-finding apparatus." Electrical Research Products, Inc. November 27th, 1931. (408211.)

27219. "Electric welding apparatus." British Thomson Houston Co., Ltd. October 1st, 1931. (408241.)

27221. "Electric starters for motor vehicle and other engines." J. H. T. Roberts. September 30th, 1932. (408306.)

27301. "Electrically-tunable systems such as wavemeters." H. W. Sullivan, Ltd., and W. H. F. Griffiths. October 1st, 1932. (408283.)

27336. "Electric cooking appliances." R. H. Rogers and R. M. Smith. October 1st, 1932. (408216.)

27460. "Transmitters for use in telephone public address and sound-recording systems and the like." D. S. S. Steuart and M. S. Steuart. October 3rd, 1932. (Cognate application 22694/33.) (408221.)

27577. "Electric heating apparatus for the application of heat to the human body." J. A. Robinson and C. J. da C. Nunes. October 4th, 1932. (408268.)

27590. "Thermionic amplifiers." Electric & Musical Industries, Ltd., and A. H. Cooper. October 4th, 1932. (408269.)

27707. "Assemblage of groups of electrical contacts for musical instruments and other purposes." N. Hall. October 5th, 1932. (408314.)

27754. "Automatic or semi-automatic telephone systems." Standard Telephones & Cables, Ltd., G. C. Hartley, and M. S. Snell. October 6th, 1932. (408286.)

27938. "Keyboard-operated telegraph apparatus." Creed & Co., Ltd., and R. G. Griffith. October 7th, 1932. (408319.)

27939. "Carrier-signalling systems." Standard Telephones & Cables, Ltd., K. G. Hodgson, S. B. Jacobsen, and F. Ralph. October 7th, 1932. (408320.)

27941. "Radio beacon for directing aircraft." C. Lorenz Akt.-Ges. January 6th, 1932. (408321.)

27943. "Power line for wireless transmitting antennæ." C. Lorenz Akt.-Ges. May 31st, 1932. (408323.)

28438. "Television apparatus." J. L. Baird and Baird Television, Ltd. October 12th, 1932. (Cognate applications 31846/32 and 32824/32.) (408332.)

28991. "Circuit-closing arrangement for the direct-current circuit of controlled rectifiers." L. Mellersh-Jackson (Siemens-Schuckertwerke Akt.-Ges.). October 17th, 1932. (408339.)

29898. "Boxes or holders of dry electric batteries." P. Downs. October 26th, 1932. (408351.)

30093. "Mounting electric motors and driving gear therefor." Brook Motors, Ltd., and J. Bailey. October 27th, 1932. (408353.)

31280. "Means for holding electrodes for electric welding." H. Barkes and J. T. Watson. November 5th, 1932. (408364.)

31659. "Prismatic lighting units." Holophane, Ltd., and S. English. November 9th, 1932. (408366.)

32194. "Electric trolley devices." R. Brooks, F. Whyman, and Associated Electrical Industries, Ltd. November 14th, 1932. (408371.)

32594. "Manufacture of pressed steel universal boxes, looping-in boxes, switch boxes, circular and oblong boxes, and other types of fittings used in connection with electrical wiring in conduit." E. J. Trawford. November 18th, 1932. (408376.)

32849. "Electric bowl heaters." J. B. Bignamy. November 21st, 1932. (408380.)

34395. "Heterodyne alternating-current generators." L. E. Ryall. December 5th, 1932. (408391.)

36928. "Electric motor-control systems." British Thomson-Houston Co., Ltd. December 30th, 1931. (408408.)

1933

1254. "Electric cut-outs of the liquid-conductor type." W. W. Triggs (Duncan Electric Manufacturing Co.). January 13th, 1933. (408415.)

1660. "Construction of electric tumbler switch." General Accessories Co., Ltd., and P. A. Johnson. January 18th, 1933. (408416.)

2420. "Directional lighting fittings." General Electric Co., Ltd., S. S. Beggs and G. H. Wilson. January 25th, 1933. (408419.)

4816. "Illuminated signs." General Electric Co., Ltd. February 17th, 1932. (408429.)

4956. "Electric welding machines." International General Electric Co., Inc. February 18th, 1932. (408431.)

5660. "Electric lampholders." F. W. Yates and J. A. O'Brien. February 24th, 1933. (408433.)

6121. "Process of manufacturing frosted bulbs for electric incandescent lamps." Teikoku Shoji Co., Inc. June 7th, 1932. (408437.)

6192. "Secret combination switches for the ignition circuits of engines." B. Lee and F. P. Bevis. March 1st, 1933. (Addition to 395778.) (408438.)

6889. "Testing arrangements in selective switching systems." Siemens Bros. & Co., Ltd., and W. G. Patterson. March 27th, 1933. (408439.)

8999. "Systems for communication by means of carrier frequencies through high-tension conductors." Siemens & Halske Akt.-Ges. March 24th, 1932. (408445.)

14885. "Electric cable conduits." G. Pasini. May 25th, 1932. (408463.)

16995. "Dynamo-electric machine control." British Thomson-Houston Co., Ltd. June 22nd, 1932. (408470.)

17998. "Submarine signalling cables." Norddeutsche Seekabelwerke Akt.-Ges. June 25th, 1932. (Cognate applications 17999/33 and 18000/33.) (408472.)

19184. "Electrically operated acoustic signalling-apparatus." Naamlooze Vennootschap Machinerieen - En Apparaten Fabrieken. July 23rd, 1932. (408480.)

19315. "Thermal switches particularly for electrically heated flat-irons and the like." British Thomson-Houston Co., Ltd. July 7th, 1932. (408482.)

19417. "Electric time-alarm systems." S. Citterio. July 9th, 1932. (408483.)

19920. "Electromagnetic winding device for clocks and spring motors and like purposes." Landis & Gyr Akt.-Ges. August 29th, 1932. (408487.)

20237. "Electrical precipitation of suspended particles from gaseous fluids." Lodge-Cottrell, Ltd. (Research Corporation of New York). July 18th, 1933. (408489.)

22855. "Electromagnetic contact-making relays." General Electric Co., Ltd., and W. R. Rose. August 16th, 1933. (408498.)

23669. "Wireless apparatus." A. V. Pettman and W. Reed-Lethbridge. September 2nd, 1932. (408502.)

25106. "Electrical apparatus for heating and storing water." Landis & Gyr Akt.-Ges. October 19th, 1932. (408508.)

25112. "Filaments of highly refractory material for electric incandescent lamps and discharge tubes." Naamlooze Vennootschap Philips' Gloeilampenfabrieken. October 13th, 1932. (408509.)

25691. "Electrical apparatus for heating and storing water." Landis & Gyr Akt.-Ges. October 21st, 1932. (408515.)

26758. "Electrically driven portable machines such as hand drills." Duss & Bender Spezialfabrik für Elektrowerkzeuge Ges. April 26th. 1933. (408524.)

27796. "Rectifying installations comprising a plurality of rectifiers." Naamlooze Vennootschap Philips' Gloeilampenfabrieken. October 27th, 1932. (408530.)

28073. "Radio receivers." Marconi's Wireless Telegraph Co., Ltd. November 8th, 1932. (408531.)

28355. "Electric lamps." British Thomson-Houston Co., Ltd. October 14th, 1932. (408534.)

28622. "Frame aerial structures." Telefunken Ges. für Drahtlose Telegraphie. October 14th, 1932. (408537.)

31652. "Inter-vehicular wireless signalling devices." H. Gossler. November 14th, 1932. (408547.)

1934

2402. "Vacuum electric tube devices or valves for use in particular gain-control circuits." E. Y. Robinson and Associated Electrical Industries, Ltd. July 4th, 1932. (Divided application on 408256.) (Cognate application 2403/34.) (408328.)

6796. "Two-way telephone and like electrical systems." Marconi's Wireless Telegraph Co., Ltd., and F. M. G. Murphy. September 3rd, 1932. (Divided application on 408300.) (408329.)

9747. "Vacuum electric tube devices or valves for use in particular gain-control circuits." E. Y. Robinson and Associated Electrical Industries, Ltd. July 4th, 1932. (Divided application on 408256.) (Cognate application 9748/34). (408330.)

Trade Mark Applications

The following are among the recent applications for British trade marks. Objections against any of the proposed marks may be entered within one month from April 25th :—

Wandering Minstrel (design only). No. 547674. Class 8. Radio receiving sets, television apparatus, and parts thereof; and electric batteries (not for medical purposes).—Burndept, Ltd., 51-53, Church Street, Greenwich, S.E.

Peero. No. 548051. Class 8. Electric batteries (not for medical purposes).—Brown Bros., Ltd., 22-24, Great Eastern Street, E.C.2.

Instasig. No. 548364. Class 8. Philosophical and scientific instruments and apparatus for useful purposes, but not including radio-telegraph and telephone instruments and apparatus.—Instanta Electric Clocks, Ltd., 1, St. Paul's Churchyard, E.C.4.

Biarga. No. 549205. Class 8. Philosophical and scientific instruments and apparatus for useful purposes. No. 549204. Class 11. Instruments, apparatus and contrivances, not medicated, for surgical or curative purposes.—Philips Gloeilampenfabriek Maatschappij, Eindhoven, Holland. (British representatives : Dicker, Pollak & Mercer, 20-23, Holborn, E.C.1.)

Circra. No. 547465. Class 13. Lanterns for electric lamps.—British Thomson-Houston Co., Ltd., Crown House, Aldwych, W.C.2.

Malstel. No. 548893. Class 13. Electric conduit fittings of ordinary metal.—Fletcher, Houston & Co., Ltd., Portfield Foundry and Engineering Works, Perry Street, Dudley Port, Staffs.

Porbonite. No. 549303. Class 40. Ebonite and goods manufactured from ebonite.—Young Accumulator Co. (1929), Ltd., Burlington Works, Arterial Road, New Malden, Surrey.

Nisoro. No. 547029. Class 50. Electrical insulating material made of resin.—Dussek Bros. & Co., Ltd., 14, Verney Road, S.E.16.

New Work for Contractors

Particulars of new works and building schemes for the use of electrical installation contractors and traders

Publication in this list is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors.

Aldershot.—Houses (75), Park Farm Estate for the Workmen's Housing Association.

Amersham.—Houses (80); R.D.C. surveyor.

Barnsley.—Houses (50), Cockerham Lane, &c.; Waller & Wood.

Bicester.—Cinema, London Road; T. Elvins & Sons, Ltd., builders, Naden Works, Soho Hill, Birmingham.

Birkenhead.—School, Preston, for E.C.

Birmingham.—Civic centre development (£278,500); city engineer and Sir Reginald Blomfield.

Bridgwater (SOMERSET).—School, Wembdon Road (£18,000), for Borough E.C.; director of education.

Brighton.—Houses (78), Dyke Road Estate; W. H. Overton, architect. Houses, Manor Farm Estate (£61,506); borough engineer. School, Warmdene Avenue, Patcham (£19,580), for E.C. Rebuilding, 202-212, Western Road (£37,000); Thomas Garratt & Son, architects.

Buckinghamshire.—School, Buckingham (£13,000), and technical institute, High Wycombe (£25,000), for County E.C.; director of education, Aylesbury.

Burnley.—School (450 places), Myrtle Bank, for Borough E.C.; director of education.

Canterbury.—Hospital, for the Kent and Canterbury Hospital Committee; secretary.

Chadwell Heath.—Houses (43), Heath Lane; Buckley Son & Wyld, Ltd.

Cheadle (CHESHIRE).—Houses (56), Beech Avenue and Hawthorne Road, Gatley; W. Hodge, builder, 8, Norwood Road, Gatley.

Cheshire.—Senior Council School, Rudheath, near Northwich (£28,371); F. Anstead Browne, county architect, the Castle, Chester.

Cornwall.—School, Helston, for County E.C.; director of education, Truro.

Coventry.—Houses (150), Stoke Aldermoor, and technical college (£142,228); city engineer. School, Hen Lane Estate, for E.C.

Cupar (FIFE).—Houses (52); A. H. Hayton, Commercial Road, Leven.

Dalbeattie.—Houses (64), Moss Road; Jn. Gibson, 44, High Street.

Ebbw Vale.—Houses (40); U.D.C. surveyor.

Edinburgh.—Houses (28), Redford; E. T. Rae, city architect, City Chambers. Primary school, Holy Cross Academy (£14,000), for E.C.; Education Offices, Castle Terrace.

Epsom.—Houses (400), Tolworth Hall Estate, Ewell, for Brand Estates, Ltd.; secretary.

Galashiels.—Houses, Ash Street; J. Watson, burgh surveyor, Burgh Chambers.

Glasgow.—Houses (297), Shuna Street Estate, and 308 houses, Teucharhill Estate; housing director and trade contractors. Cinema, Renfield Street, for Paramount Theatre (Glasgow), Ltd. Workshops for the blind (£22,000); superintendent, Royal Asylum for the Blind, Castle Street. High school for girls (£150,000); city architect.

Glass Houghton (NEAR PONTEFRACT).—Houses (20); C. F. Napper, architect, 41, Station Parade, Harrogate.

Gravesend.—Congregational church, Hartley; R. Hopkins & Sons, builders, Gravesend.

Grays.—Houses (30); U.D.C. surveyor.

Greetland.—Public shelter and lavatories (electrical work), Cross Hills; F. Moore, U.D.C. surveyor.

Grimsby.—Cinema, Queen's Hall; S. Weiss.

Guildford.—Shop and offices, 53 and 54, High Street; Marks & Spencer, Ltd. Shops and offices, High Street; Prudential Assurance Co., Ltd.

Hadleigh (ESSEX).—Houses (220), Hollywood Estate (electrical work), for J. S. Cooper.

Hagley (STOURBRIDGE).—Telephone exchange for H.M. Office of Works, King Charles Street, London, S.W.

Hartley Wintney.—Houses (56); R.D.C. surveyor.

Hertfordshire.—School, Osidge Estate, East Barnet (£20,926), for County E.C.; county surveyor, Hatfield.

Hindley.—Houses (64); O. P. Abbott, U.D.C. surveyor.

Huddersfield.—Houses, Alder Street, Southgate, and Waterhouse Street; L. Smith, architect, Town Hall.

Irish Free State.—(LIMERICK).—Installation of electric lighting, &c., and extensions mental hospital, for the Committee of Management; Sheahan & Clery, architects, 47, O'Connell Street. (NENAGH, Co. TIPPERARY).—Houses (111); W. J. Chadwick, architect and town surveyor, Town Hall.

Jarrow-on-Tyne.—Houses (160); J. Scott-Weir, borough engineer, Town Hall.

Kinghorn.—Houses (28), Eastgate; Williamson & Hubbard, Royal Bank Buildings, Kirkcaldy.

Kingston-on-Thames.—Houses (252), Richmond Park Estate; borough surveyor. Guildhall (£80,136); Gee, Walker & Slater, Ltd., builders, 32, St. James's, London, S.W.

Kirkcaldy.—Houses (32), Kinglossie site; Williamson & Hubbard, Royal Bank Buildings.

Lanarkshire.—Reconstruction of technical school, Coatbridge, for C.C.; Offices, Lanarkshire House, Ingram Street, Glasgow.

Leeds.—Hotel (£500,000), for London, Midland and Scottish Railway. Extensions, Hospital for Women, for the Board of Management (£10,000); Chorley Gribbon & Foggitt, architects, 3, Park Place.

Lichfield.—Houses (28); C. T. Read, city surveyor.

Liverpool.—Factory, Walton Hall Avenue (£40,000), for Robert Gregory & Co.

London.—(BERMONDSEY).—Dwellings (106), Renforth Street (£50,000), and flats (38), Bryans Court (£20,914); borough engineer. (DEPTFORD).—Houses (95), Vesta Road; H. Macintosh, 1, Imperial Buildings, Croydon. (ELTHAM).—School, Appleton Road; St. Mary's Catholic trustees. (FINCHLEY).—Houses (49), North Circular Road (£17,300); F. S. Moss, Ltd. (GREENWICH).—Rebuilding Albert Dock Hospital (£45,000), and kitchen and dining room block, Dreadnought Hospital (£25,000), for governers; secretary. (HACKNEY).—Dwellings, Northwold Road (£31,000); L.C.C. architect. School, Mount Pleasant Lane (£13,233); W. H. Gaze & Sons, Ltd. (ISLINGTON).— Houses, Crescent Avenue (£17,000); L.C.C. architect. (LEWISHAM).—Houses (42), Butterfield Street; New Ideal Homesteads, Ltd. (ST. JOHN'S WOOD).—Block of flats, Abbey Road; A. H. Neave. (ST. MARYLEBONE).—Flats (32), Fisherton Street Estate; H. V. Ashley, architect. (SOUTHGATE).—Houses (98), Broadfields Estate; Reader Bros. Flats (60), Reservoir Road; borough engineer. (SOUTHWARK).—Houses, Tarn Street (£164,000); L.C.C. architect. (STEPNEY).—Houses, Shepherd Street (£14,000); L.C.C. architect. (SYDENHAM).—Blocks of flats, West Hill and Crystal Palace Road; Waring & Nicholson. (WESTMINSTER).—Buildings, Prince Consort Road; Sir Aston Webb & Son. Dwellings, Ebury Bridge (£220,000); A. J. Thomas, architect. (WOOD GREEN).—Library enlargement (£37,886); borough engineer.

Luton.—Schools, Hart Hill, for Borough E.C.; J. A. Gotch, assessor architect.

Manchester.—Flats (313), Stangeways; Salford Housing Ltd. Schools, Wythenshawe Estate (£39,700), for E.C.

Mansfield.—Houses (72), New Mill Lane; H. Rouse & Sons.

Middlesex.—Offices, Willesden, at the corner of Sidmouth Road (£18,500), for C.C.; county architect, Guildhall, Westminster, London, S.W. Extensions, Central County Hospital (£24,268); Newby Bros., Ltd., Southgate, N.

Morden.—Cinema, shops and car park, St. Helier Estate; H. A. Yapp.

Nantwich.—Houses (42); U.D.C. surveyor.

Newcastle (STAFFS).—Police station (£25,000); town clerk.

Northallerton.—Methodist Church, Crakehall; W. Dougill, architect, 127, Chatham Street, Liverpool, 7.

Northampton.—Covered swimming bath; J. C. Prestwich & Son, architects, Bradshawgate Chambers, Leigh.

Northwich.—Senior school, Rudheath (£28,371), for E.C.

Oxfordshire.—School (200 places), Littlemore, for County E.C.; director of education, Oxford.

Patcham.—Houses (32), Varndean Estate; F. J. Wellman.

Peterborough.—School (600 places), for City E.C.; S. Dodson & Son, architects.

Pilcot (BASINGSTOKE).—Houses (40), for Jac. Martans, Ltd., Farnham.

Reigate.—Re-erection of Gatton Hall, residence of Sir Jeremiah Colman.

Salisbury.—Houses (42), Pembroke Park Estate; city engineer.

Sanderstead.—Houses (85), Limpsfield Road; S. P. Chapple & Co.

Sanquhar.—Houses (28); burgh surveyor, Town Hall.

Scarborough.—Hospital, Scalby Road (£109,000); Foster & Dicksee, builders, James Street, Rugby.

Selsdon (SURREY).—Houses (324), Old Farleigh Estate; R. Costain & Co., Ltd.

Sevenoaks.—Houses (24), Southernhay Estate, Carters' Hill, Seal, for L. E. Jones & Son.

Shotts.—Houses (40), Dykehead and Stone; offices, Lanarkshire House, Ingram Street, Glasgow.

Slough.—Houses (24), Cippenham Lane, for Salt Hill Estates, Ltd.

Somerset.—School, Keynsham, for C.C.

Southall.—Houses (33), Park View Road; F. S. Honey.

Stockport.—Business stores (£60,000), Chestergate, for the Co-operative Society; secretary.

Stockton-on-Tees.—Houses (48), Greylands Avenue; A. J. Blackett, builder, Norton Road. Cinema, Borough Hall; J. Clayton, architect, High Row Chambers, Darlington.

Stranraer.—Houses (60), Murrayfield Gardens; J. Mercer, burgh surveyor, City Chambers.

Surrey.—Mental deficiency colony, Botleys Park (£430,000), for C.C.; county architect, Kingston-on-Thames. Two central schools, Wallington, for the County E.C.; secretary, Kingston-on-Thames.

Tonbridge.—Houses (46); R.D.C. surveyor.

Towcester.—Houses (31), Wood Burcote Road; R.D.C. clerk, Council Offices, Park Street.

Tynemouth.—Houses, Verne Road; S. Pye, builder, North Shields. Administration block, Moor Park Hospital (£12,592); B. Peele, Ltd., builders, East Hill Works, North Shields. Improvements to bathing pool (£6,980); borough engineer.

Wallasey.—Labour exchange, Mersey Street, for H.M. Office of Works.

Walsall.—Houses (49), Parker Street, &c. (£13,300); L. G. Peace.

Wanstead.—Houses (44), Wanstead Lane; P. G. Ashton.

Warburton (CHESHIRE).—Cabinet making works and 400 houses, Dunham Massey, for the Co-operative Wholesale Society, Ltd.

West Riding.—Technical school, Todmorden, for County E.C.

West Sussex.—Extensions, Worthing School of Arts and Crafts, for County E.C.; C. G. Stillman, county architect, North Street, Chichester.

Wigtownshire.—School, Stranraer (£16,500); R. G. Logan, architect, Stranraer.

Woking.—Houses (40), Westfield; U.D.C. surveyor.

Woodstock.—Senior school for the Church of England Managers; secretary.

Worcester.—Senior school, Merriman's Hill, for E.C.; A. Parker, architect.

Yeovil.—Houses (129); borough surveyor.